SOCIETY FOR ADVANCEMENT OF MANAGEMENT

# Advanced Management

UNIV. OF MICHIGAN
NOV 20 1951
ENGINEERING LIBRARY

COMBINED WITH MODERN MANAGEMENT

IN THIS ISSUE

## THE MANAGEMENT VIEWPOINT

- The President of Nabisco Tells the Story of his Organization
- What Makes an H.R. Program Click at Gardner Board & Carton Co.
- Sun Shipbuilding Meets Vast Increases in Control Problems
- Charting the Informal Organization
- Statistical Aids for Accuracy

VOL. XVI NO. 11

NOVEMBER 1951

New and exclusive office procedures—using Remington Rand's unique team of Punched-Card Methods and Kardex Visible Systems—give you the facts you need to get top production from available facilities . . . at lowest possible cost!

# 2 ways to get more production—faster

**1.** Shorten the production planning cycle by getting firm schedules into the plant faster . . . and
**2.** Speed actual production by eliminating the causes of many delays on the production line.

Here's how you do it. Use Remington Rand punched-card machines to develop, correlate, sort and print the "mass" of facts you need for efficient production planning. It's the fastest method known!

Then, for effective *control,* post essential facts to a Kardex visible system. Kardex graphically charts the facts you need to determine scheduled requirements and control procurement, receipts and disbursements of all parts and materials.

**Users report these outstanding results.** They maintain schedules . . . meet promised delivery dates . . . keep all inventories in balance. What's more, they secure all the facts they need to comply with government regulations on inventories and to report requirements under CMP. Most important, they get these facts as a routine procedure without maintaining separate records.

**For Production Executives:** New 56-page study, *Production Control Systems and Procedures (X1268)*—outlines complete procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Call the nearest Remington Rand Business Equipment Center, or write to Management Controls Reference Library, Room 1460, 315 Fourth Ave., New York 10, New York.

Remington Rand INC

Volume XVI Number 11
November, 1951

*Editor-in-Chief*—DILLARD E. BIRD

*Consulting Editors*
ROBERT P. BRECHT JOHN F. MEE
DON F. COPELL HAROLD F. SMIDDY
RALPH M. BARNES

# Advanced Management

**NATIONAL OFFICERS: 1951-52**

President — LEON J. DUNN, *Assistant to the Executive Vice President, Veeder-Root, Inc., Hartford, Connecticut*

Executive Vice President — EDWARD W. JOCHIM, *General Manager Chicago Plant and Member of the Board of Directors, Personal Products Corporation, Chicago, Ill.*

Secretary—HOWARD K. HYDE, *Department of Defense, Washington, D. C.*

Treasurer—BRUCE PAYNE, *President of Bruce Payne & Associates, Inc., Westport, Conn.*

Director-at-Large—DILLARD E. BIRD, *Management Counsel, Westfield, New Jersey*

Executive Director—C. A. SLOCUM

**NATIONAL VICE PRESIDENTS**

Vice President, Management Research and Development — HAROLD F. SMIDDY, *Vice President, Management Consultation Services Division, General Electric Company, New York*

Vice President, Student Chapter Operations and Development—RALPH L. JACOBS, *Management Consultant, Cincinnati, Ohio*

**PAST PRESIDENTS**

ORDWAY TEAD, *Editor of Social and Economic Books, Harper & Brothers, New York, New York* (1936-37)

WILLIAM H. GESELL, *Vice President, Lehn & Fink Products Corporation, Bloomfield, New Jersey* (1937-39)

MYRON H. CLARK, *Management Consultant, Boston, Massachusetts* (1939-41)

J. KEITH LOUDEN, *Vice President, York Corporation, York Pennsylvania* (1941-42)

PERCY S. BROWN, *Retired New Hampton, New Hampshire* (1942-44)

RAYMOND R. ZIMMERMAN, *Special Assistant, Economic Cooperation Administration, Washington, D. C.* (1944-46)

HAROLD B. MAYNARD, *President, Methods Engineering Council, Pittsburgh, Pennsylvania* (1946-47)

WILLIAM L. MCGRATH, *President, The Williamson Heater Company, Cincinnati, Ohio* (1947-48)

CHARLES C. JAMES, *Associate Counsellor, Stevenson, Jordan & Harrison, New York, New York* (1948-49)

DILLARD E. BIRD, *Management Counsel, Westfield, New Jersey* (1949-51)

## CONTENTS

The Nabisco Formula ..... 2

*by George H. Coppers*, President, National Biscuit Company

Clarity is the Keynote in Our Communities ..... 8

*by E. T. Gardner*, President, The Gardner Board and Carton Co., Middletown, Ohio

Statistical Aids for Accurate Standard Data ..... 11

*by Gerald Nadler*, Ph.D., Assistant Professor of Industrial Engineering, Washington University, St. Louis, Mo.

High-Speed Methods Mean High-Gear Expansion ..... 16

*by Charles H. Doyle*, Controller, Sun Shipbuilding and Dry Dock Co., Chester, Pa.

Society News ..... 19

Individuals — and a Team — Will Make It Work ..... 22

*by Harold R. Nissley*, Management Consultant, Cleveland Heights, Ohio

Charting the Informal Organization ..... 24

*by William B. Seiniger*, Assistant Dean, School of Business Administration, University of Buffalo, Buffalo, N. Y.

The Management Bookshelf ..... 27

***DISCLAIMER:*** Every effort is made to verify the information published in ADVANCED MANAGEMENT. The opinions of the authors, however, are not necessarily the opinions of the Society and this periodical accepts no responsibility in connection with any liability which might develop as a result of articles published. All unsolicited articles, manuscripts, letters, and pictures sent to ADVANCED MANAGEMENT are sent at the owner's risk, and ADVANCED MANAGEMENT expressly repudiates any liability or responsibility for their safe custody or return.

ADVANCED MANAGEMENT, published monthly by Society for Advancement of Management, 411 Fifth Avenue, New York 16, N. Y., is merged with MODERN MANAGEMENT, and is successor to The Society for the Advancement of Management Journal, the Bulletin of the Taylor Society and of The Society of Industrial Engineers. Re-entered as second-class matter, December 23, 1949, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Copyright, 1951, Society for Advancement of Management.
Subscription rate: $8.00 per year. Single copies: 75 cents (members); $1.00 (non-members). An index to ADVANCED MANAGEMENT is published annually, and the contents are also indexed in *Industrial Arts Index* which is available at Public Libraries. Notification of address changes must be given four weeks in advance.

# The Nabisco Formula

By GEORGE H. COPPERS

President, NATIONAL BISCUIT COMPANY

***Recipes for quality products—and for quality management—have built NBC to leadership in one of the world's most vital industries. Here is a top management man's story of what is being done to advance the science of management in his company.***

THE EFFECTIVENESS of a system of management controls must be judged primarily in the light of the special economic characteristics of the industry for which it has been developed. More particularly, the goals of the individual business enterprise within the industry will govern the specific techniques which are necessary to measure progress and assure staying on its course until these goals are attained. In many cases such goals may never be fully realized. Also, as the business concern matures, the ultimate goals may change and new control techniques must be adopted to meet the changing conditions.

If management is to steer a steady course and remain fully in command of its ship, specialized control techniques must be found to provide quickly, and at minimum cost, the essential data pertaining to its operations, covering both short-term and long-term goals of the enterprise.

In order to provide some background material, let us review briefly certain economic facts of the baking industry, and National Biscuit Company — "NABISCO"—in particular. In this analysis we shall deal primarily with quality and cost control problems as they affect both distribution and manufacturing activities.

## QUALITY CONTROL

National Biscuit Company was incorporated in 1898 as the result of a combination of several local biscuit and cracker manufacturers. One of its first goals was to institute uniform quality of product. It took the industry out of the cracker barrel stage when in 1899 it introduced the first packaged cracker, UNEEDA BISCUIT, to the retail stores. Since that time continuing research has played an important part in developing today's modern packages which help to preserve the oven freshness of our two hundred varieties of biscuits and crackers. Individual packaging and brand name identification made the goal of uniform quality possible.

One of the major problems of the biscuit and cracker division of the baking industry is an effective and efficient distribution system. Its products are fragile, light in weight but bulky, and relatively low priced per pound. With national distribution, more than 500,000 retail store operators must be supplied with fresh merchandise at the time needed, at the place desired and in adequate quantities to meet consumer demand. Since our products are perishable, stocks on the store shelves must be kept at reasonable levels to insure their freshness when purchased by consumers. Many of our products are subject to the "impulse" type of buying, which causes considerable fluctuation from day to day in the sales level of individual varieties. Competition from other biscuit and cracker manufacturers as well as from other related food products is constantly making demands on the limited grocery store shelf space, with the result that continual servicing of our products in the biscuit departments of the stores is a necessity.

NABISCO's answer to these distribution problems is a system of truck delivery of our products to the stores by a fleet of over 1300 trucks plus a sales force of over 2600 salesmen calling on the stores weekly, with both groups operating out of approximately 230 sales branch warehouses strategically located in the major cities of the United States. The sales branch warehouse is an essential factor in the successful distribution of biscuit and cracker products. Functionally, it is a decentralized self-sufficient merchandising unit. Organizationally, it consists of district salesmen, deliverymen, warehouse and office employees. Inside operations are under the direct supervision of an Office Manager, while the Sales Manager directly supervises all sales activities and at the same time is held responsible for efficient operation and administration of the entire warehouse operation.

**CHANGE OF S.A.M. NATIONAL HEADQUARTERS ADDRESS**

We are pleased to announce that on and after November 19, 1951 we will be located at Room 601, 411 Fifth Avenue, New York 16, New York.

MUrray Hill 3-6042

**SOCIETY FOR ADVANCEMENT OF MANAGEMENT, INC.**

It is the district salesman's responsibility to call on all the retail food stores, restaurants, hotels and other outlets for our products in an assigned geographical area as often as it is necessary to service the stores properly. In addition to direct selling to the stores, the salesman performs an additional function of weekly rearrangement and restocking of shelves in the biscuit department after the order has been delivered by truck to the store. Under direct selling to retail stores, this service function is imperative in order to insure that proper rotation of stocks will prevent the development of stale merchandise. Monthly reports of the dollar value of such stale returns from the stores are required from each branch warehouse to inform management of any serious condition developing in the stores in any area. In addition, sales supervisors work each territory periodically with the salesmen and submit reports on the condition of merchandise in the stores. Salesmen are also responsible for local merchandising and sales promotion activities, including the building of special mass displays of a featured product, tie-ins with advertising programs, and window and counter displays where possible.

All orders secured by the district salesmen flow into the branch warehouse each day, are assembled in truckloads by the warehouse employees and, after billing and manifesting by the office, are delivered by truck directly to the retail stores, usually within 48 hours of the salesman's call. The importance of maintaining proper inventories of finished products at the sales branch warehouses cannot be stressed too highly, and branch managers are held strictly responsible for proper ordering of merchandise from the bakeries to meet the ever changing demands of the retail merchants. Promotional activity, seasonal factors and changes in consumer tastes all play a part in determining the sales volume of the individual varieties of merchandise.

In order to meet these problems, warehouse employees take a physical inventory of all items each week and prepare and submit merchandise requisitions on the bakery source of supply to replenish their stocks. Reports of slow-moving or surplus varieties are submitted periodically to top management in order to prevent serious over-stocked conditions developing in the field. Likewise, records of the number of out-of-stock items cut from orders are reviewed constantly. These reports are submitted to District Sales Managers' offices, with copies to the General Office, for review, and the field sales management is held responsible for prompt disposition of surplus merchandise by transfer to other branch warehouses or through special merchandising activity at the local branch.

| UNIT EFFICIENCY DATA | | | | |
|---|---|---|---|---|
| OFFICE | CURRENT MONTH | | THIS YEAR TO DATE | |
| | BUDGET | ACTUAL | BUDGET | ACTUAL |
| ORDERS PER 100 HOURS | | | | |
| NO. OF LEDGER DEBIT POSTINGS | √ | | √ | |
| DEBIT POSTINGS PER 100 ORDERS | √ | √ | √ | |
| AVERAGE VALUE PER ORDER | √ | | √ | |
| | | | | |
| WAREHOUSE LABOR | √ | √ | √ | √ |
| STOCK UNITS PER 100 HOURS | | | | |
| | | | | |
| AUTO DELIVERY WAGES | √ | √ | √ | √ |
| STOPS PER 100 HOURS (N.B.C. DELIVERYMEN ONLY) | | | | |
| MILES PER 100 HOURS (N.B.C. DELIVERYMEN ONLY) | | | | |
| DEL. UNITS PER 100 HOURS (N.B.C. DELIVERYMEN ONLY) | | | | |

CHART A. — Nabisco holds that sales and expense budgets are Plans of Operation, not just forecasts. Here is one of the branch office control forms used under this operational plan.

Therefore, by means of a system of truck delivery direct to retail stores, frequent sales calls, weekly rotation of store stocks by salesmen, sales supervision inspection and reports, stale return report, frequent sales branch inventories and surplus stock reports, top management is assured that the high quality merchandise delivered to the sales branches by the bakeries reaches the ultimate consumers in a fresh and appetizing condition.

## COST CONTROL

The size and nature of NABISCO'S nationwide distribution system has made control of distribution costs equally as important as control of manufacturing costs. Several techniques have been developed to aid management in maintaining high efficiency in its distribution system.

Each sales branch maintains a complete set of accounting records of all transactions, including the submission of a statement of detailed expenses and balance sheet at the close of each calendar month. Due to the ready salability of our finished products, a system of internal check and accounting control is essential. Merchandise is billed to the sales branch at list sales price and a reconciliation of the finished product account is made each month. For this purpose, physical inventory is taken and checked by two inventory crews at the close of each calendar month, one crew under the supervision of the office manager and one under the branch sales manager. Physical quantities are extended at list prices to secure the dollar inventory value, and branches report the value of any unaccounted for merchandise differences each month. This method of internal control over merchandise stocks has been highly effective in keeping shortages of merchandise to a minimum and has been inexpensive to administer.

For each major controllable expense account, rough but simply applied standards have been established. Both sales budgets and expense budgets are prepared by branches for each month's operation approximately two months in advance, and indicated results are reviewed and approved by field management and the interested General Office Department to insure efficient planning of operations. Performance reports covering the monthly operating periods are subsequently analyzed against both the budget and prior performance to point up operating weaknesses and to insure follow-up to correct unsatisfactory conditions. In preparing performance reports, Sales Branches are permitted to

SUMMARY FOR THE MONTH OF _____

COMPARISON OF ACTUAL LABOR WITH STANDARD

| BAKING | DIRECT LABOR | | INDIRECT LABOR | | TOTAL LABOR | | -MEMO- | PREMIUM HOURS |
|---|---|---|---|---|---|---|---|---|
| | HOURS SAVED OR LOST | % PERFORM-ANCE | HOURS SAVED OR LOST | % PERFORM-ANCE | HOURS SAVED OR LOST | % PERFORM-ANCE | % PERFORM-ANCE LAST MONTH | |
| DAY SHIFT | | | | | | | | |
| NIGHT SHIFT | | | | | | | | |
| THIRD SHIFT | | | | | | | | |
| | | | | | | | | |
| TOTAL | | | | | | | | |
| PACKING | | | | | | | | |
| DAY SHIFT | | | | | | | | |
| NIGHT SHIFT | | | | | | | | |
| THIRD SHIFT | | | | | | | | |
| | | | | | | | | |
| TOTAL | | | | | | | | |
| ICING | | | | | | | | |
| DAY SHIFT | | | | | | | | |
| NIGHT SHIFT | | | | | | | | |
| | | | | | | | | |
| TOTAL | | | | | | | | |
| | | | | | | | | |
| BAKERY TOTAL | | | | | | | | |

| REASONS FOR HOURS SAVED or LOST | BAKING | | | | PACKING | | | | ICING | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DAY SHIFT | NIGHT SHIFT | 3rd SHIFT | | DAY SHIFT | NIGHT SHIFT | 3rd SHIFT | | DAY SHIFT | NIGHT SHIFT | | |
| BREAKDOWNS | | | | | | | | | | | | |
| EXTRA HELP | | | | | | | | | | | | |
| STACKING ON FLOOR | | | | | | | | | | | | |
| SHORT RUNS | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| MAN OUTPUT | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| INDIRECT LABOR | | | | | | | | | | | | |
| TOTAL | | | | | | | | | | | | |

**CHART B. — An important production control factor is in the daily acquisition of direct and indirect labor costs. Nabisco uses this simplified summary form in this phase of its management control.**

make allowance in expense accounts for variable expense directly related to volume changes so that net variations in theft of merchandise and cash, secondly expense for the actual performance volume stand out more clearly. In our thinking sales and expense budgets are primarily plans of operation rather than simply forecasts of expected conditions. Explanations of major variations from budgets are required at the time the performance reports are submitted.

At the present time a study is being conducted to determine more accurate standards for measuring efficiency in clerical work performance. Due to the similarity in operations of the standardized procedures in effect at the Sales Branches, it is expected that a completely realistic standard can be provided for use in controlling the number of man hours required for the major repetitive functions performed, such as billing and manifesting, ledger posting, sales record keeping and cash settlement handling. The necessity for controlling the ever increasing cost of clerical labor is well realized in industry today.

In sum, sales and distribution costs are controlled first, through a strong system of internal control, subject to frequent audit, as a safeguard against theft of merchandise and cash, secondly by comparison of operating results with pre-determined budgets or standards, and thirdly, by constantly improving operations at the least efficient branch warehouses as they are spotlighted through comparisons of inter-branch operating reports.

## SALES VOLUME CONTROL

In a broad sense, control of sales volume means control of all activities which are designed to secure maximum sales as distinct from reducing costs, and, as such, includes quality control as well as all forms of advertising, selling techniques and package design. At this point in our discussion, however, we are concerned with those control techniques which enable top management to ascertain that the sales programs in effect at all 230 sales branches are producing results.

After physical inventories are recorded in a simplified Kardex stock control ledger, monthly sales of each type receptacle of individual varieties are determined and reported promptly to District Sales Managers' offices, with copies to the Marketing Division of the General Office Sales Department. Analyses are made of sales trends, variations from sales budgets, and top management is kept quickly and thoroughly informed of the results of special merchandising programs. Supplementing the direct sales reports on our own products, outside marketing services keep top management informed as to the comparative result on distribution and actual store sales by our competitors in the light of existing general economic conditions in retail food store sales. Periodically salesmen are required to furnish details for each customer's account of competitive stock placement and estimated sales in relation to our merchandise. After review by local management to insure prompt follow-up of unsatisfactory conditions, the reports are summarized by areas and in total to inform management of the degree of progress in increasing

our share of the existing and potential market for biscuit and cracker products. Sales reports are submitted by each Sales Branch comparing current total sales with last year by weeks and comparing current sales against budgets by monthly periods.

From this brief survey of some of the distribution problems of our industry, let us turn now to management control problems in the production end of our business.

## PRODUCTION QUALITY CONTROL

At the turn of the last century biscuit and cracker bakeries were essentially local entities, each producing small volumes of a miscellaneous group of products for consumption in the local surrounding territory. The finished products were packed loose in barrels or large returnable containers, to be sold by the pound in the stores and carried home by the consumer in paper bags. Under such conditions, merchandise quickly lost its oven fresh appeal, breakage was high, and sanitary handling of this food product was virtually impossible on its trip from bake shop to consumer.

One of the first and most important goals of the National Biscuit Company, therefore, was to package its products in such a way that the high quality and freshness of its manufactured products would be insured until finally eaten in the consumer's home. This goal has largely been achieved through the improvements in packaging and establishment of an adequate distribution and merchandising system. Today packing specifications for our products are rigidly followed by each of the bakeries. A continuing program of laboratory testing under conditions similar to those found in all types of retail stores under varying climatic conditions insures that our moisture-proof packages will fully protect the finished product until it reaches the consumer. Over half of the packaging material consumed at our bakeries is produced in our own board mill and printing and carton plants.

A second and continuing goal of NABISCO was to produce the highest quality merchandise under the most sanitary conditions possible. Through a program of modernization of bakery facilities, which is still in progress today, NABISCO has been a real leader in the industry, not only in developing and installing the hundreds of technological improvements that have been made in our industry but also in setting the highest sanitary standards for bakery operations and in providing greatly improved working conditions for our production employees. In order to control quality, formulae have been developed for all products which specify the quantity of each ingredient to be used, the time baked and the finished product count per pound. Samples of each product are tested continuously during each baking run and finished product yields are checked to insure uniformity in product size and weight. Daily controls are also maintained on carton weights and broken and rejected merchandise.

Of the raw material ingredients used in baking biscuits and crackers, soft wheat flour is by far the largest volume item. In 1950 NABISCO used the equivalent of over 20-million bushels of wheat. More than 90% of the flour consumed was produced in our own flour mills in order to control the quality and uniformity of this most important raw material. Reports to local management and to the General Office keep management informed of these important quality control features of our operations.

## PRODUCTION COST CONTROL

The ultimate goal of every business in a free enterprise economy is to maximize the profit volume ratio. Since we are dealing here with a highly competitive industry, much of it local in scope as compared to NABISCO's nationwide coverage at uniform prices, management control of operating costs becomes essential. The cost of employees' services in the baking industry is considerably higher than in many manufacturing industries, approximating one-third of total net sales revenue. Thus, by necessity, management must devote considerable time and effort to a review of labor costs, and many of our management control techniques have been developed in this field.

A system of standard direct labor reports has been used by NABISCO for many years. These reports are made up locally at each bakery and specify the number as well as the classification of each direct employee required both for baking and packing operations on each receptacle of every variety of product manufactured at the plant. More recently, similar standards have been determined for indirect labor on all manufacturing operations. The standards are attainable under efficient operation and take into consideration the actual mechanical operating situation at each bakery. As new technological improvements are installed at the various locations, the standards are revised to conform to the new local operating level. Reports are prepared daily at each bakery location showing a simple percentage ratio of efficiency against these standards for each manufacturing labor department. (Chart B) This summary report is placed on the local bakery manager's desk each morning covering the previous day's result and action can be taken immediately to correct unsatisfactory conditions. At the end of each month a summary report is submitted to the General Office from each bakery for further review and comparison with other bakery locations.

One of the factors greatly affecting labor efficiency in the baking industry, especially at this time is the rate of turn-over of employees. Many of the operations require a high degree of skill and all require an on-the-job training period, varying in length depending on the particular operation. This training period makes a high rate of turnover costly.

In order to reduce labor turnover, many obstacles must be overcome. As has been indicated, above, there is considerable fluctuation in the sales level of individual varieties due to seasonal and weather factors, changes in consumer demand and the impulse type of buying which is so prevalent in our industry. Furthermore, the perishable nature of our products requires that good judgment be exercised in keeping inventories at reasonable levels, not only on the retailer's store shelves, but also at our sales branch warehouses and our bakery shipping branches. A partial answer to this continuing problem has been found in a production stabilization program that has been developed and installed over the past four years. The results to date have been highly gratifying to management from a cost control standpoint and have been equally beneficial to employees in smoothing out

## Control Variations Under the OLD PLAN

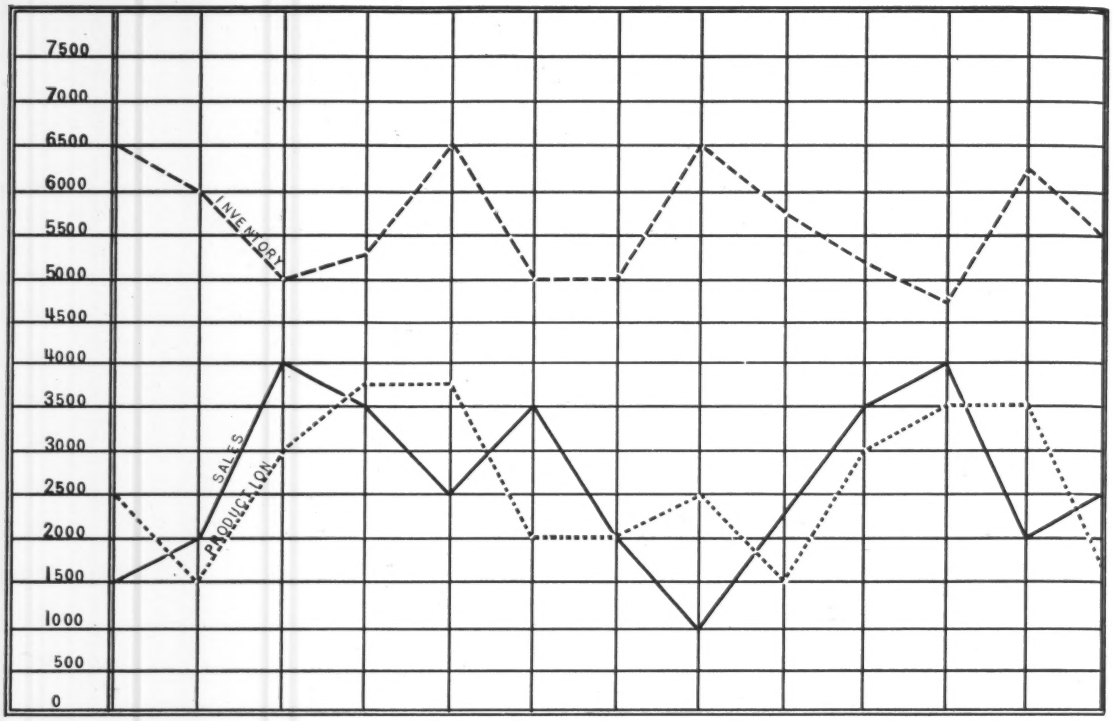



CHART C.

the peaks and valleys of employment. At the same time inventory control has been maintained and out-of-stock conditions have definitely improved. Thus sales and distribution along with production are benefiting from this program.

The accounting techniques required for the production stabilization program involve the preparation of a monthly sales budget or plan by each of the 230 local sales branch warehouses, prepared 25 calendar days in advance of the performance period. These sales budgets, after adjustments to reflect desired closing inventory positions, become tentative orders on the bakeries approximately one month ahead of the time production will occur. After consolidation of all sales branch tentative orders for each bakery, a tentative production program is worked out at each bakery and the number of oven hours' production determined. These individual bakery tentative programs are submitted to a production planning group in the General Offices of the Company where members of the Production Department, Distribution Division of the Sales Department and the non-operating Budget Division of the Controller's Department review the programs. Where individual bakeries are unable to meet the production demands of the tentative orders, transfers to bakeries with surplus facilities are given full consideration. After considering the comparative costs of such production transfers and other possible solutions to the problems, a final determination is made as to the production level of operations to be scheduled for each plant.

These production schedules are completed well before the performance period starts and a stable level of operation is normally maintained during the entire operating period. However, shipments of finished products from the bakery to the sales branch warehouses are made based on actual weekly orders submitted currently to the bakery shipping branch. Experience has shown that while there may be individual fluctuations between the tentative orders and the actual order subsequently placed by an individual branch, in total the final consolidated figure has worked out very accurately both for planning as well as for forecasting of actual results. (Charts C & D)

Further application of the budget principles to our industry, and for NABISCO in particular, is in the planning stage at the present time. Two developments in the industry have stressed the importance of its application. One was the development of the band oven which has made mass production techniques in the industry not only feasible but necessary to maintain low cost production in the highly competitive food industry.

The installation of band ovens resulted in a substantial change in the process of manufacturing biscuits and crackers. With this type of oven, the biscuits and crackers in dough form are fed directly from the cutting machine, by means of canvas aprons, on to thin metal bands, which convey the product in a continuous operation through the baking chambers. The baking chambers are heated by gas burners, located above and below the steel bands and the amount of heat applied can be regulated in the various baking chambers during all stages of the baking operation. The finished product is conveyed from the bands, at the end of the oven, by canvas aprons, to the packing tables. The entire baking operation is automatic. A single-story building of considerable length is best adapted to band oven installations.

With the old style reel and traveling types of ovens, biscuit and cracker doughs have to be removed from the

## Control Variations Under the NEW PLAN

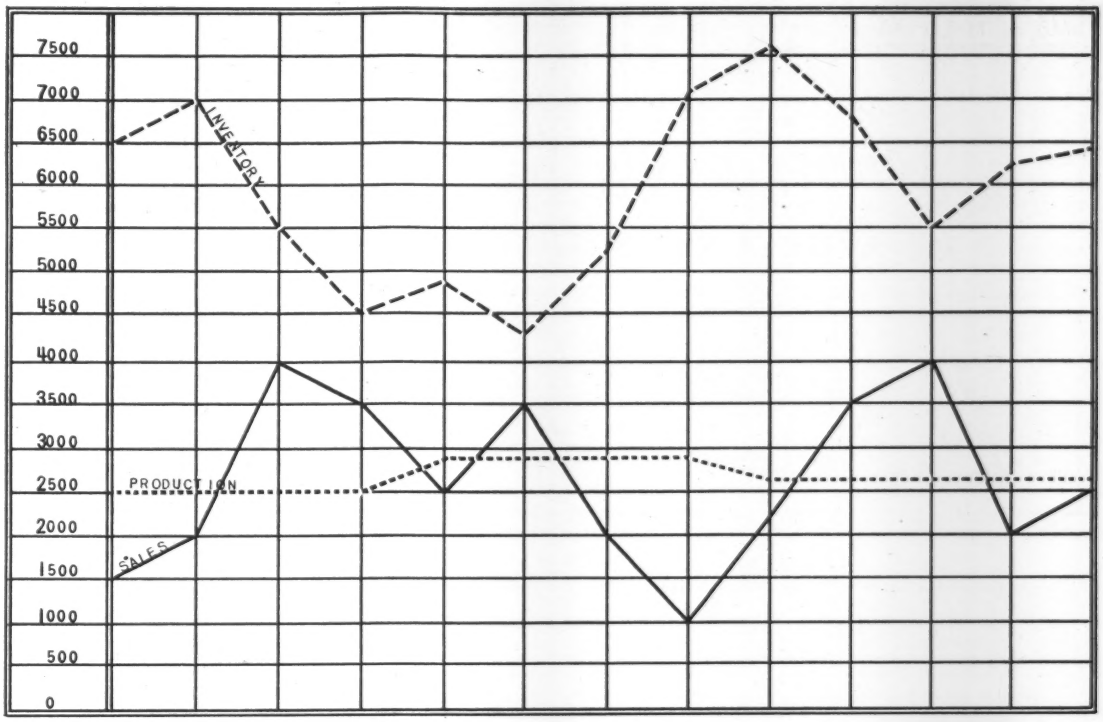



CHART D.

cutting machines on peels, or pans, and carried by hand to the oven opening. After the baking operation is completed, the finished product must be removed, again by hand, and placed on trays, to be conveyed to the packing tables. Heat for reel ovens is furnished by the burning of gas, coke, or coal at the bottom of the oven, and it is, therefore, impossible to vary the heat during the different stages of the baking operation. A multi-story building was best adapted to the reel type oven bakery. Through the use of the new band ovens, it is possible to increase production up to double the amount of the finished product per day as compared to production on the reel type oven. The result of the introduction of the band oven has been that fewer bakeries turn out much greater quantities of merchandise at far greater efficiency.

The second development has been the speeding up of the technological improvement in packaging biscuit and cracker products. The cost reduction possibilities in mechanizing the packaging operations are very significant, but the successful low cost utilization of such capital equipment will depend on long runs of standard sizes of individual variety receptacles. The number of such machines and their location will depend on such factors as the need for flexibility in packaging more than one product from a single oven, on the number of oven hours required per year for the variety to be packaged, dollar savings in labor cost, relation to transportation and other alternative costs, and, finally, on the current as well as potential demand for the individually packaged products. Long-term as well as short-term planning will be essential to determine the maximum volume profit ratio not only in selling but in determining the production facilities required for such sales. Furthermore, the development of technological improvements in baking and packaging our products will require an even closer degree of coordination between sales planning, production scheduling, and supply procurement, in all of which the tool of budgeting can provide a more effective means for management to control production costs, quality of product and quantity of inventory.

These are but a few of the management control techniques now being used by NABISCO in its biscuit and cracker operations. Some of the goals of our business enterprise have largely been fulfilled and the resulting control techniques serve primarily to keep management informed that the standards are being maintained. Other goals are constantly changing and new techniques are being developed to further their achievement. The entire program is dynamic and our success will continue to depend on our ability to meet the challenge of ever changing conditions through simple yet effective management control techniques.

In closing, there is one important factor which has not been brought out in the above discussion. A system of management control is only as good as the caliber of the Company's organization. It takes people to get things done. Even though the best of plans are conceived by the management of an organization and control techniques are established to provide the necessary information as to progress, no control system in itself will insure that these plans are actually carried out unless the organization is cooperatively working together to insure the success of the enterprise. The limitations of space make it impossible to fully explore this problem of proper personnel and assignment of capable people to the various tasks in an individual concern. All we can do is to bring out the absolute necessity for building such an effective organization.

# Clarity is the Keynote in Our Communications

By E. T. GARDNER
President, The Gardner Board & Carton Co.
Middletown, Ohio

***Cartoon-illustrated labor contracts, "crackerbarrel" public relations and a lot of activities to insure close personal touch with employees and their families are the sort of things that go to make up this Mid-West manufacturers' all-out efforts to promote better understanding of the Free Enterprise system.***

INDUSTRY HAS A RESPONSIBILITY far greater than just making and selling its products at a profit; greater than just providing good working conditions, benefits and wages for employes.

Industry must not only believe in the free enterprise system—it must also help promote a thorough understanding of free enterprise, among all peoples!

It is not enough for industry just to "do right." It must also tell about it. At least that's the theory held by The Gardner Board and Carton Co., Middletown and Lockland, Ohio, manufacturer of paperboard, paper boxes and folding cartons.

## GOOD NEIGHBOR POLICY

Employee and community relations at Gardner are based on this theory. And though we are a relatively small concern—2,000 employees—we have a program designed to further understanding of free enterprise in a large way.

Gardner officials believe employees have a right to know what the company is doing . . . plans to do . . . and why . . . and that if employes know these things, they will do better work because of it . . . will be finer American citizens and more constructive members of their communities.

The company strives to be a "good neighbor" in its plant communities. It believes industry should play a leading role in promoting and supporting worthwhile community projects, in addition to providing good working conditions and wages for employees.

## THE PEOPLE JUDGE

Through such programs, Gardner believes it is helping increase the "life expectancy" of the free enterprise system. And for good reason. As our Vice President, Colin Gardner III, puts it:

"We believe the free enterprise system will fare very well in the final judgment of the people when they know the facts.

"We are more than willing to stand trial for at least our intentions and aims . . . but we are not willing to stand idly by and see this system, for all its shortcomings, be discredited and bankrupted because the people did not understand its merits as well as its deficiencies."

The Gardner Story just begins here, however. Following its own advice, the company maintains large-sized community and employe relations programs. These programs include: sponsorship of three radio programs; a boy scout troop; a Junior Achievement company; a college scholarship fund; a multi-purpose training program; and a broad external and internal communications system.

## OVER THE CRACKERBARREL

Newest of Gardner radio programs is "The Middletown Crackerbarrel," a weekly forum-type discussion. Its regular members are twelve well-known civic leaders. Included are the city manager, president and manager of the Civic Association, managing editor of the local newspaper, chairmen of the city board of health and planning commission and representatives of several local industries. Guest experts are invited each week to join the regular cast. Any subject from strictly local to international interest is likely to be discussed on the "Crackerbarrel." Recent topics included the Truman-MacArthur controversy; and over emphasis on inter-collegiate athletics.

Other radio programs are broadcasts of Middletown high school football and basketball games. Commercial time on these programs is used to explain what the problems, accomplishments and contributions of industry mean to community welfare; as well as plugging civic projects.

Gardner's scholarship fund was established during the company's 50th Anniversary celebration last year. When in full operation, it will provide educational grants of $500 each for four years to 16 students. Each year, four students will be selected from high schools in Middletown and the Greater Cincinnati area, where our major operations are located.

## AID FOR CIVIC PROJECTS

Use of the scholarships is restricted to a list of outstanding colleges and universities which are largely privately endowed. The grants were limited to such schools because Gardner officials felt private colleges are more than ever in need of public support in these times of rising prices and falling enrollments.

As an added feature to our scholarship program, we recently awarded more than $1,000 in prizes to winners of three emblem design contests. The contests

were held to find a new company emblem. Contests were staged for students of the Dayton Art Institute, the Art Academy of Cincinnati, and the general public. Winner of the $250 grand prize in the contests was a second-year student at the Dayton Art Institute. The prize money will pay his tuition next year. Gardner also hired him to work in the company art department during the summer.

Financial aid to civic projects is an important part of the Gardner program. Several months ago the company gave $40,000 to the Middletown Civic Association. The money will be used to expand the association's Fresh Air Camp for underprivileged boys and girls.

### TELL STORY OUTSIDE

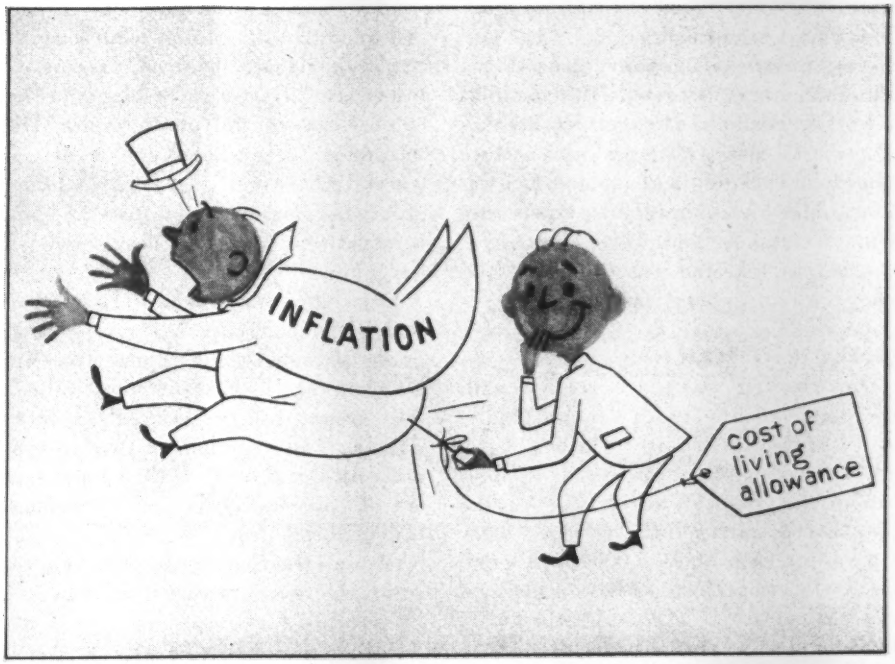
To keep the public well aware of what Gardner and its people are doing, regular contact is maintained with area newspapers and the wire services. Important news material is thoroughly explained in news releases.

The company's monthly employe newspaper, "This Is Gardner," is mailed regularly to some 1,000 residents and business places in the plant communities. These include: lawyers, doctors, other industries, city officials, banks, barber shops and schools.

Publishing a newspaper is only the first step, however. It's also important to make sure employes are able to read and understand it; and that they like to read it. To help insure "readability" of the paper, it is regularly tested for reading ease and interest. The Rudolph Flesch "readability" tests are the main measurements for this work.

### "INFORMATION PLEASE"

Internal communication is a field that can be easily neglected, and Gardner makes every effort to avoid this. Management people are always informed first when new plans and policies are to be installed. This may be done through a bi-monthly news letter, called the "Gardner-gram," other written announcements, or management meetings. The latter are held regularly for management people on all levels. Personal letters to all employes also play a big part. They are used to explain such things as: the effect of a Wage Stabilization order on Gardner people; current




Cartoons like this highlight a new labor contract with "eye appeal" drawn up by The Gardner Board and Carton Co. This cartoon illustrates Gardner's cost-of-living benefits for employes, based on increases or decreases in the government's cost-of-living index.

First winners of the Gardner Scholarship Fund receive congratulations from President E. T. Gardner of The Gardner Board and Carton Co., sponsors of the fund. From left to right: Gardner, Ned H. Martin, Geraldyne Baker, William G. Bowen, and Alan H. Spindler.

business conditions; a decision to sponsor a radio broadcast.

Most recent of company plans in the communications area was the installation of free information service for employes. Twenty reading racks were placed in various plant and office locations. The racks hold magazines, reprinted articles and pamphlets. Employes may take the material home and pass it along to their families.

### SOME LIGHT TOUCHES

Our reading racks are refilled with new material three times a month. Material for the service is furnished by a well-known organization which specializes in that type of work. Cost for the company is only a little over two cents a week for each of its 2,000 employes.

One of the most widely acclaimed strides made by Gardner was its move last year to make union contracts more readable. The company's present contracts are illustrated throughout with color cartoons and photographs. These introduce various sections of the contracts. An example: photographs of union bargaining committees and management representatives head sections on bargaining.

Since the contracts were first distributed, the company has received hundreds of requests for copies from firms all over the U. S. Many have indicated they might follow the pattern set by Gardner. The company's two contracts are with Local 1009, United Paperworkers of America (CIO), and the United Independent Paper Workers, in Lockland and Middletown, respectively. The contracts were printed in large (10-point) type to make them easier to read; bound in the standard form of a legal document.

As the next step in making contracts more readable, Gardner hopes to simplify the language. Most contracts are written in legalistic phraseology, and this is what keeps employes from reading them — or understanding, if they should happen to read them.

### "GEARED" TRAINING

Gardner's training program also holds a big spot in employes relations. The program goes beyond providing qualified people to fill company jobs. In the words of Richard L. Siegel, director of industrial and public relations: "it helps employes help themselves to develop to the limits of their own abilities."

The whole training set up is geared to meet the needs of the company and the desire of employees for advancement. In all departments, Gardner men and women are now training for better jobs. Some Gardner trainees — usually those preparing for work in manufacturing, engineering and industrial engineering —spend as long as two or three years in training.

First step in the general training program is indoctrination, which gives employes an over-all picture of the company, its operations and policies. This phase often lasts six months or longer. The trainees then enter their own specialized programs.

### A $60,000 PROGRAM

Programs like these, we believe, can be highly successful in helping to further understanding in industry. And they are not too costly. The entire human relations program at Gardner is operated on a budget of less than $60,000 a year. (This does not include, however, the special $40,000 donation this year to the Middletown Civic association mentioned above.)

Company officials are confident such employe and community relations programs pay off. In our case, employees like their company—and they stick with it. They are proud of the steps the company is taking in their communities. Likewise, residents in Gardner communities are learning more and understanding more about the company—and about the free enterprise system. They like what they're learning.

## The Gardner Blueprint for Employee Training

A MULTI-PURPOSE TRAINING program is paying off at The Gardner Board and Carton Co., Middletown and Lockland, Ohio. Gardner men and women are now training for better jobs in all departments. Nine employes of the company recently took a special six-week course in fundamentals of printing at West Virginia Institute of Technology, Montgomery, W. Va. They studied under seven of the nation's leading experts on printing.

Such special courses, however, are only one phase of Gardner plans to prepare its people for better jobs. The whole Gardner human relations program is set up to meet the needs of the company and the desire of employes for advancement.

First step in the general training program is indoctrination, which gives employes an over-all picture of the company, its operations and policies. This phase often lasts six months or longer. Employes who plan to enter sales usually spend an additional six months working in various departments. Salesmen of paperboard products need a lot of know-how.

Operations trainees, which includes manufacturing, engineering, and industrial engineering, are likely to spend as long as two or three years in training.

A big part of the program centers around foremen. Regular training meetings are held for them by top management and industrial relations personnel. Outside speakers are often brought in for these sessions.

Women receive much of the training. Seven were recently schooled for work in Gardner's quality control program. They spend eight hours a day for two weeks in classroom study, followed by on-the-job training. Another group will soon begin study for quality control jobs.

High school students also train for jobs with Gardner. Nine seniors worked half-time as "co-ops" in the company's general office last year. They now hold full-time jobs.

# Statistical Aids for Accurate Standard Data

By GERALD NADLER, Ph.D.

Assistant Professor of Industrial Engineering
Washington University, St. Louis, Mo.

***More than ever statistics play an important role in management and industrial engineering. Not only has statistics become something desirable, but it is something essential in modern industry. The material presented here represents a more reliable basis for deciding upon the disposition of time study data in the standard data application.***

THE INDIVIDUAL TIME STUDY is good for more than just the rate set on the job. It is possible to utilize elemental allowed times as determined by our time studies for standard data purposes, so that the rate for a job may be set up without any time study on that job. The procedures used today in setting up standard data charts, formulas, and classifications are more of the "hit and miss" or "rule of thumb" system than should be necessary.

Statistical methods offer a way to obtain not only more accurate standard data but also a method for obtaining a check on the correctness and amount of error in our original time studies. The purpose of this article is to give some of the simple statistical procedures that will aid in the setting up of more accurate standard data values and then to point out some of the uses for checking individual elemental allowed times. Some of the statistical techniques will be familiar to those who have an acquaintance with quality control procedures. There will be no attempt to explain the theory behind the techniques, inasmuch as most of them are widely used.

Before the following methods are used, there should be at least two time values for each element that is to be grouped for standard data purposes. It is preferable to have the same number of allowed times for each element. For example, if there are ten jobs which have related elements, then the same number of time studies of each of these ten jobs should be available for use. Again, there must be at least two time values and preferably the same number of time values of each element.

## STEPS TO TAKE

The first step after obtaining the allowed times (or standard time before allowances are included may be used as long as all of the time values are of the same base) is to make an $\overline{X}$ and R Chart of the allowed time values of each element. To illustrate the simplicity of making an $\overline{X}$ and R Chart an example will be used which follows the procedure necessary. The illustration used will be for element one of ten different jobs when the jobs were in the same family. The procedure would be identical even if the elements were from jobs completely unrelated in terms of a family of jobs. Two time studies were taken of each job.

*Step 1.* The element one time values for each job were first averaged and the differences between the two values were found as is shown in Figure One. This difference between the two values is called the range (R), and if more than two values are used in the calculation, the range will be equal to the maximum time value minus the minimum time value.

*Step 2.* All of the average values ($\overline{X}$) are added and the average of the averages ($\overline{\overline{X}}$) is found. In this case, the total of the $\overline{X}$'s was 539.5 (in .001th minute), the number of values making up this sum is 10, and therefore $\overline{\overline{X}}$ is equal to 54. The same procedure is followed for the range and $\overline{R}$ is found in the same manner.

*Step 3.* A control chart in Quality Control is used to illustrate the variability or spread which can be expected when a constant system of chance causes is operating. The control chart consists of a central line indicating the average of the variable being charted. Two control limits, one above, the other below the center line indicate the spread or variability that could be expected a certain number of times out of 100 from this system of chance causes by chance alone. The variability that could be expected 95 times out of 100 by chance alone will be used to determine the control limits for $\overline{X}$ charts in the following discussion, and 99.7 times out of 100 for R chart. When a point goes beyond either of the control limits, there is good reason to suspect that the point being plotted is not from the same system of chance causes that originally determined the average and spread of the chart. This control chart is useful in determining whether or not the basic variability of the data as expressed by the range will allow us to say that the time study data available represents a situation where there is some factor or factors affecting the time values.

## FINDING CONTROL LIMITS

The control limits for the $\overline{X}$ control chart are found in the following manner. Since there are two time values that make up each $\overline{X}$ there is a certain confidence that can be placed in the range of those two values in relation to the expected range of a much larger sample from the same system of chance causes.

## TIME STUDY VALUES (IN .001 MIN) FOR ELEMENT I FROM 10 JOBS

| Job | Element I | | $\bar{X}$ | R | %R |
|---|---|---|---|---|---|
| | Study 1 | Study 2 | | | |
| 1 | 58 | 54 | 56 | 4 | 7 |
| 2 | 54 | 52 | 53 | 2 | 4 |
| 3 | 55 | 52 | 53.5 | 3 | 6 |
| 4 | 51 | 48 | 49.5 | 3 | 6 |
| 5 | 49 | 48 | 48.5 | 1 | 2 |
| 6 | 50 | 51 | 50.5 | 1 | 2 |
| 7 | 52 | 52 | 52 | 0 | 0 |
| 8 | 49 | 51 | 50 | 2 | 4 |
| 9 | 51 | 51 | 51 | 0 | 0 |
| 10 | 75 | 76 | 75.5 | 1 | 1 |
| | | Totals | 539.5 | 17 | 32 |
| | | | $\bar{X}=54$ | $\bar{R}=1.7$ | $\bar{\%R}=3.2$ |

FIGURE 1.

A measure of this confidence is expressed in a factor $d_2$. There is a separate value of $d_2$ for each subgroup size that may be used. Looking at Table One, we find a $d_2$ value of 1.128 for a subgroup size of 2. The upper control limit for the $\bar{X}$ control chart then becomes $54 + (2 \times 1.7) \div (1.128 \times \sqrt{2})$ or 56.13. The lower control limit is equal to $54 - (2 \times 1.7) \div (1.128 \times \sqrt{2})$ or 51.87.

The control chart is made with lines for $\bar{\bar{X}}$ and the upper and lower control limits as shown in Figure Two. The average time values of element one of each of the jobs is then charted and connected (as in Figure 2). The jobs are not charted in any special order. Since many of the points fall outside of the control limits, we are able to say that there is a definite indication that the time values for this element did not come from the same system of chances, and that therefore there is some factor or factors affecting these time values which we will try to isolate.

*Step 4.* The range for each job for element one is next divided by the average of that job and multiplied by 100 to put the range in terms of per cent of the average. For job one, for example, the range was 4 and the average was 56; therefore range in per cent of average was 7 per cent. The remaining values of per cent of R are shown in Figure 1. The per cent of averages are then added and the total is divided by the number of values. In this case, the sum of the ranges in per cents of averages was equal to 32 and the average per cent range was equal to 3.2.

*Step 5.* A control chart for % R is made in the following way:

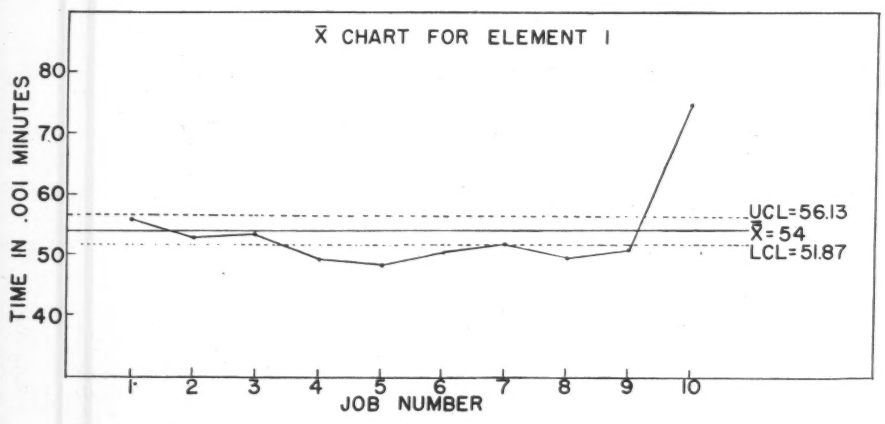
As for the $\bar{X}$ chart, there are values expressing the limits which can be placed on the range determined with a certain subgroup size. These values are known as $D_3$ and $D_4$, and Table Two gives these values for various subgroup sizes. $D_3$ is used to calculate the lower limit for R Chart and $D_4$ is used for calculating the upper limit. The upper control limit is equal to $3.27 \times 3.2$ or 10.47, and the lower control limit is equal to $0 \times 3.2$ or 0. The per cent R chart is shown in Figure Three.

### ACCURACY EXPECTANCIES

In terms of usual accuracy of time study values, we speak of $\pm 5$ percent of the total allowed time as desirable. Notice that the percent R chart gives the total range of expected accuracy which in the total situation would be 10 per cent. Actually, notice that the desired per cent error for each element should be smaller, since the error involved by adding values with certain errors is not equal to or less than the largest error of any individual value, but is affected by each error as can be calculated statistically. We can conclude from this per cent R chart that the % R is within fairly desirable limits and that the spread which may occur by chance alone from this system of chance causes is from 0 to 10.47. Therefore, the $\bar{X}$'s which were calculated for this element from each job were well controlled in terms of the variability of the time study averages for the same element of each job.

*Step 6.* We must next find the dimensional influences on our time. This may take the form of one, two or more variables. If, on the other hand, at this point we had found that the different time values which occurred from our time studies could have happened by chance alone and that the per cent R chart was satisfactory, there would be no need of going any further with this procedure. The $\bar{X}$ found could be used as the average time to be allowed for that constant element. The usual method today for determining the variable or dimensional factor influencing our time is to experiment by plotting the allowed time versus

FIGURE 2.



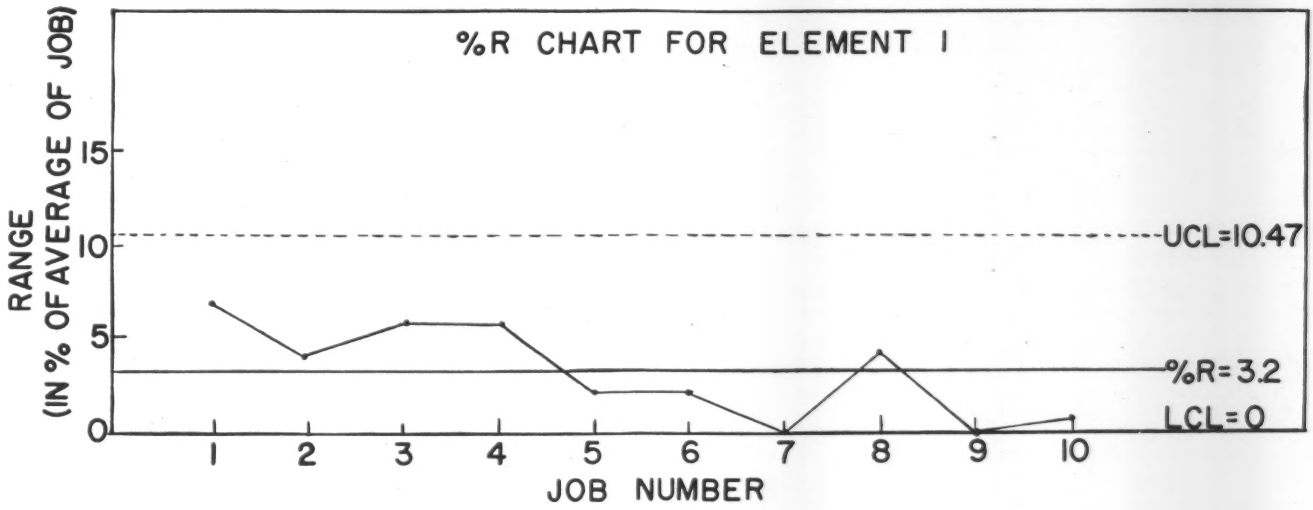



FIGURE 3.

possible variables. There is an improvement upon this procedure which is useful. The aids to determining the factor to be used in relating the time values are the correlation techniques (linear, non-linear, and multiple). Since it is not absolutely necessary to use the correlation procedure to find the variable, but is rather desirable, the discussion of procedure and use of correlation is omitted.[1]

By either the hit or miss procedure or correlation procedure, the variable affecting the time must next be found. In this illustration the variable happened to be the top box area. (If no variable can be found, there may be gross errors in the time studies themselves. This source of error should be checked carefully.)

*Step 7.* The time values are plotted against the variable. The next step is to fit a curve to the existing data. The fitting of a curve up to this time has usually been by sight. Some people have suggested that the straight line be fitted by the method of least squares. There are many situations, though, where a straight line does not give the true or best values for the data. For example, if we fit a straight line by the method of least squares for the data plotted in Figure Four, we find that there are many places on the curve where we can introduce an error of 10 to 12 per cent from the average actually obtained from the time studies. To correct this situation, the proper curve should be fitted according to statistical methods.

There are a number of curves that can be fitted to data collected from time study. The one most useful besides the straight line is a parabola. It was felt that a parabola would better fit this data than a straight line. The formula for the parabola is:

$$y = ax^2 + bx + c \qquad (1)$$

where

y = time (or dependent variable)

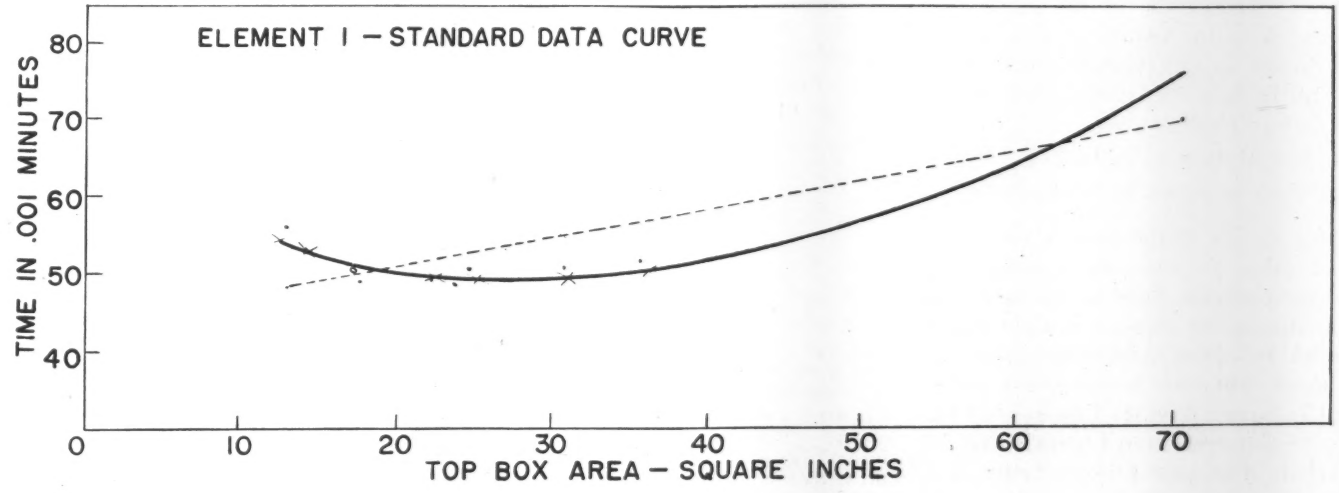
x = the dimensional factor (or independent variable)

a, b, c = constants determined from the present values of x and y

These constants can be determined by

[1] A suggested, but not complete, discussion of this application is given in K. J. Hartman, "Application of Correlation Analysis in Establishing Standard Data," *Industrial Management Bulletin*, Industrial Management Society, Chicago, Illinois, November-December, 1948.

FIGURE 4.



## TIME STUDY VALUES (IN .001 MIN) FOR ELEMENT 4 FROM 10 JOBS

| Job | Element 4 | | $\bar{X}$ | R | %R |
|---|---|---|---|---|---|
| | Study 1 | Study 2 | | | |
| 1 | 25 | 22 | 26.5 | 3 | 11 |
| 2 | 25 | 26 | 25.5 | 1 | 4 |
| 3 | 26 | 26 | 26 | 0 | 0 |
| 4 | 27 | 26 | 26.5 | 1 | 4 |
| 5 | 26 | 30 | 28 | 4 | 14 |
| 6 | 33 | 26 | 29.5 | 7 | 24 |
| 7 | 27 | 26 | 26.5 | 1 | 4 |
| 8 | 26 | 26 | 26 | 0 | 0 |
| 9 | 26 | 32 | 29 | 6 | 21 |
| 10 | 31 | 29 | 30 | 2 | 7 |
| | | Totals | 273.5 | 25 | 89 |
| | | | $\bar{X}$=27.4 | $\bar{R}$=2.5 | $\overline{\%R}$=8.9 |

FIGURE 5.

simultaneously solving the following three equations:

$$a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2 = \Sigma x^2 y$$
$$a\Sigma x^3 + b\Sigma x^2 + c\Sigma x = \Sigma xy$$
$$a\Sigma x^2 + b\Sigma x + nc = \Sigma y$$

where

$\Sigma$ = summation of the individual values. With the values of a, b, and c determined in this manner, we then arrive at the formula for the parabola for the data of element one.

$$y = .0147x^2 - .824x + 61.73$$

This curve is shown in Figure Four.

*Step 8.* To further verify the better relationship between the existing data and the parabola fitted to the data than that obtained by fitting a straight line, a test for goodness of fit of the curve can be made. This test is commonly called the Chi Square Test for Goodness of Fit. It is readily seen from Figure 4 that the parabola does give a much better relationship to the obtained data than the straight line. The Chi Square Test indicates this by showing that the variation of the existing data from the fitted curve could occur 99.999% of the time by chance alone, or that the probability is 99,999 times out of 100,000 of getting Chi Square of the size obtained or larger in this application by chance alone. Therefore, it may be concluded that the curve fits the data extremely well. For a straight line, the probability of chance occurrence is .911. Although in most situations this represents a good fit, it must be recognized that we should get as good a fit as possible and that the errors from the straight line give us a much higher percentage mistake than from the parabola.[2]

[2]For the detailed explanation and procedure to be used in the Chi Square Test, see: Peters, Charles C., and Walter R. Van Voorhis, "Statistical Procedures and the Mathematical Bases," Chapter 14, McGraw-Hill Book Company, Inc., New York, 1940.

To further illustrate the complete procedure for standard data, the time values for element four of this same family of jobs have been subjected to this same procedure. The time study values are shown in Figure 5 and the $\bar{X}$ and per cent R chart and calculations are shown in Figure 6. The conclusions that can be reached from an observation of Figure 5 are:

1) The differences in time values for element four for the 10 different jobs, could have occurred by chance alone.

2) The average per cent range is 8.9 with the probability of chance occurrence of a value of the % range being limited at 29.1 per cent. This indicates that we might expect by chance alone for element four as much variation in the range as 29.1 percent. There is a great deal more variability in this data than we would normally accept, indicating that perhaps there was some factor, such as method, pace, rating, etc.,

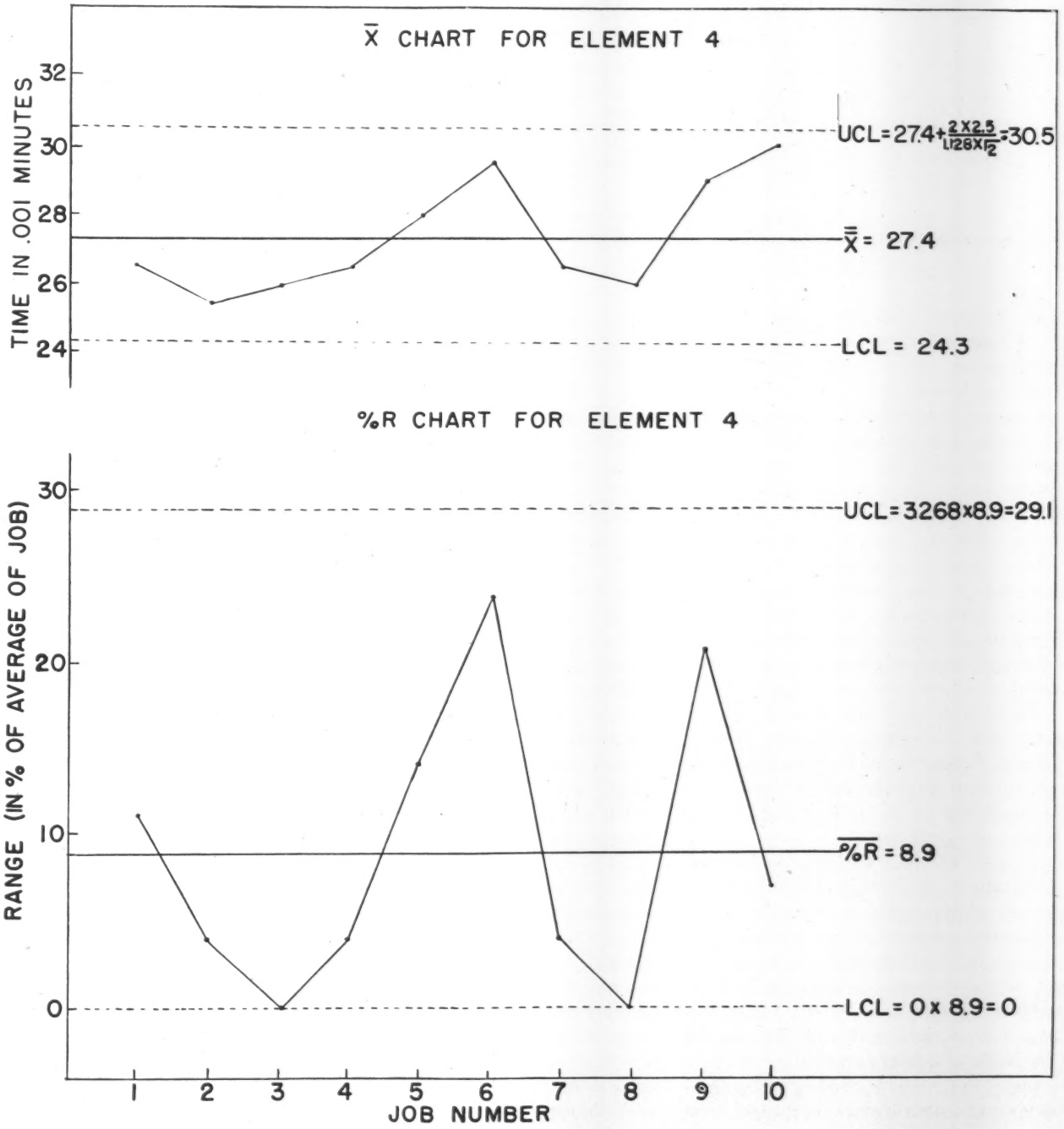
which gave us such wide variability. We might, therefore, attempt to find the cause of this variation, eliminate it, and re-time our job.[3]

[3] Another possibility for variation is the spread or variability of the individual time values in the time study itself. This variability may be checked and controlled by the method in M. E. Mundel, "How Many Readings For a Time Study?", *Modern Management*, Vol. 9, No. 6, August, 1949, p 21.

3) From the data available, we cannot, with any justification, assume any other value than the average 27.4 for the allowed time for this element.

The use of statistical techniques in time study is expanding. It is possible to use this same procedure, for example, where we have more than one variable. The method to be used in analyzing the data where more than one variable exists is quite similar to that outlined. The information which we can get from the use of the above mentioned statistical techniques will lead to better and more accurate standard data. It is important to remember that the procedure can be applied to elements which are thought to be similar even though the jobs are not from the same family.

FIGURE 6.



# High-Speed Methods Mean High-Gear Expansion

By CHARLES H. DOYLE

Controller, Sun Shipbuilding & Dry Dock Company
Chester, Penn.

***An old hand at adjusting to tremendous changes in volume of business, the shipbuilder has some special techniques for handling swift expansions. Here is an outline of procedures which speed Sun Shipbuilding's production planning, payroll preparation, cost finding and other important controls.***

PRODUCTION PLANNING, cost finding and payroll handling with the aid of punched-card accounting procedures (machine tabulating) has effected large savings at Sun Shipbuilding and Dry Dock Co. But perhaps even more important than the direct savings that have resulted from faster handling of figures, statements and reports, has been the greater variety and timeliness of the control reports and figure facts now available to Sun's management.

But before going into some of those elements, a word about our punched-card method of handling the voluminous detail connected with payrolls:

Those who have had occasion to observe the lineups, and the milling crowds, before the pay windows of big factories or of yards such as ours, must be impressed by the sheer waste of time that is involved.

Until 1943, Sun had been blowing the quitting whistle 15 minutes early to allow its employees to line up before the paymaster's windows to get their weekly envelopes. At that time we employed about 36,000, on a weekly payroll exceeding two million dollars. Under the pressure of war work and the critical shortages of labor, a study was made of some of the methods used in other shipyards and other major industrial centers. As a result, the Remington Rand punched-card accounting procedure was installed. Using this method, the tabulator printing of checks permitted their distribution to workers on the job—and from that time on the whistle has blown at the regular time for each shift.

## EXPANSION PROBLEMS

Most management men faced unexpected or unforeseen expansion problems during World War II, and it will be equally disrupting in our overall Defense efforts if management is not prepared at this time. Our executive management at Sun Shipbuilding has laid its program of preparation. In the Controller's Department our procedures have been carefully reviewed to this end. We have found that the mechanization which we adopted in 1943 is equal to any sudden increase in our workload.

At the time we first installed these punched-card machines we desired a single important result: that of systematizing our Payroll department to speed up the payment of weekly wages. But since that time we have been able to produce 52 important management reports from the information and facts which we compile in our basic punched-card system.

Without any increase in staff we can produce out of the six master decks of punched cards: payroll, seniority, union, checkoff, hospitalization (employees' and dependents') bonds, check reconciliation, vacation reserve, Veteran's report, W-2 address file, distribution, unclaimed wages, cost accounting, billing, Social Security file, age computation, contracts, class and rate reports, personnel records, foundry report, earnings records (including O. A. B.), stores, inventory, welding footage, accounts payable analysis, taxable wages, average earnings report, casting report and production control reports.

To secure these widespread control benefits we added to a qualified staff such punched-card equipment as automatic key punches, interpreters, high-speed sorters, printing-multiplying punches and alphabetical tabulators, in the quantities necessary to handle the increased workload.

## 200 HOURS—OR THREE

At the present time although we produce over fifty reports from our punched-card master files, less help is required than was necessary to do a much smaller volume of work manually.

Perhaps the most dramatic example of the speed of tabulating equipment occurred when Sun began to make up its seniority lists. Seniority control files were set up and listing were produced about every two months, showing for every employee the man's identification number, Social Security number, class rate, seniority in years, and whether veteran or non-veteran. One tabulating clerk prepares this report in three hours on our alphabetical tabulating machine, doing work that would have taken five girls a full week (or 200 hours) to type.

Much of our management report information comes from basic data punched into our master payroll card files. We actually operate from six master decks: Name and Rate file, Deductions file, Distributions Class & Rate file, Inventory Balance file, Extension file and Seniority file.

In 1945 we devised a punched-card procedure to make our Distribution of Labor Costs reports more accurate. At one time we determined average rate of pay for distribution purposes by dividing payroll total by the hours worked in a department and then arrived at a figure which became the average rate.

Under the punched-card procedure, labor distribution reports are produced daily; each department is balanced out, both daily and monthly; the cards are sorted down by charge number; everything is accumulated on each charge for all departments involved, and one posting is made each month. We have found that six to eight tabulating clerks do the job more accurately and promptly than had been the case when 17 or more were required for manual postings.

### LESS TIME, NO WORRY

The cards are sorted to rate, and then each group of rates is sorted in hour order. The extended pay amounts give the actual rate on distribution of labor costs to the particular job charge.

Unpaid wage accounts have always presented difficulties. Under the punched-card system, a tabulating card is punched for each item of unclaimed wages, showing the date, the man's number, name, Social Security number, and the net amount due. A file is set up on this unclaimed wage account. This control has saved two-thirds of the effort—and has eliminated all of the worry.

Control has been achieved in a similar manner in the matter of vacation reserve accounting. A few years ago a vacation reserve plan was set up for every employee, showing the proportion of his vacation unused at any given time. Each month a twelfth of the amount of vacation time to which he would be eligible is added to the total amount already shown. Under this plan, the cost of this earned vacation time is charged against all the jobs for the month, and this is a much more direct method than was the old system of basing vacation charges on a percentage of the payroll for the previous year.

### ANALYZING LABOR COSTS

Another punched-card application at Sun Shipbuilding involves an address file punched on tabulating cards for every employee on the payroll and for each employee who has left the company's service during the past year. These files are used for many purposes, chiefly for the addressing and mailing of W-2 tax forms at the end of the year.

Distribution cost cards are coded according to major work classifications and then by other related codes. New construction, ship repair and miscellaneous sales are the three major codes.

**Ready adjustment to vast changes in volume of business is a management necessity in shipbuilding. This photo shows an Esso tanker being launched by Sun Shipbuilding & Drydock Co.**

There are 35 separate departments and several hundred different charges that could be used by each department. It is possible to have as many as 14,000 charges in a single day (all coded).

The cards are run through the sorter to arrange them—at the rate of 25,200 sorts an hour—in proper order for the various groups or classifications of charges. For example, if an analysis of the labor cost of Ship Repairs is desired, and Code "7" designates an item of this class, the sorter can select all cards punched with a "7" in the primary code column, thereby picking out all the Ship Repair charges. It would then be necessary to sort only the balance of the charge code columns in these cards to put them in proper sequence to produce the breakdown desired. However, in all cases, we process the punched-cards, which contain all the labor costs, under general charge numbers and sub-charge numbers. The resultant report of accurate and up-to-the-minute information on labor costs is sent to the Cost Department.

As a by-product of the foregoing operation, we reproduce those cards containing ship repair charge numbers and file these daily by department until the ship repair job is completed. Upon completion, these are sorted and listed by classification, item and department and the listing is sent to the billing department for application of billing rates. Under the old (manual) system, each item on each charge was posted daily for each department by class and assembled and balanced upon completion of the job.

### 'BY-PRODUCT' GAINS

When we send the tabulated report to Billing, it is the first time that the department sees labor costs, yet this procedure gives our department a report ready for applying billing rates. The punched-card procedure also enables us to assemble daily detail cards by charge numbers and department and then punch a daily summary card without any disruption of other work. At the close of the week we sort, by charge and department, and punch a weekly summary card. A monthly sort of the weekly summary cards gives us a monthly summary card. Later, the monthly summary cards

are sorted to department order and we list sub-totals on the several hundred different charge numbers.

Sun Shipbuilding's distribution of costs procedure gives an important production control. In the course of compiling distribution reports, we assemble complete labor costs on every job. By the term "job" we include a complete breakdown on work in process by department, and hours worked. From the report we compile, the Production Control department produces graphs and curves are made. These curves are correlated with predetermined production curves and our management has an up-to-the-minute status report.

## EMPLOYING IS EASIER

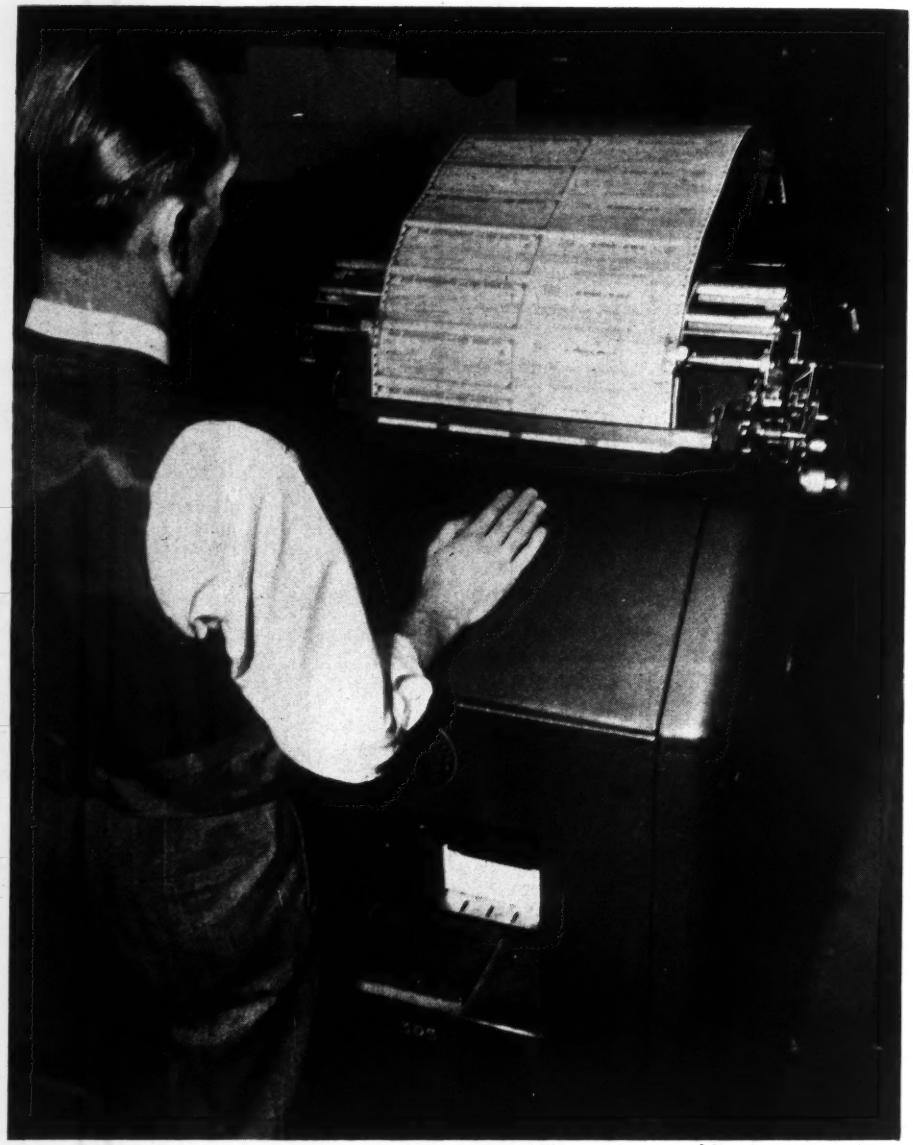
To provide detailed records for the Personnel Department we keypunch into a master deck of cards information on: department, man number, name, yard service, color and sex, age, rate of pay, (craft) seniority, location (residence), amount of insurance (Company Plan), hospitalization (Company Plan), dependents' hospitalization, and date of birth.

If information is needed for calling men back to work (on density of labor pool by residence, on seniority or upgrading) the Personnel Department calls upon our Tabulating Department to pull the statistical information required. For instance, if the yard has an emergency call for 100 riggers or shipfitters we pull the information required and place in the hands of the Personnel Department, seniority, rate of pay, yard service, age and where located, in no time at all.

## FOR MATERIALS CONTROL

An ever-present work problem is that of preparing payroll reports for the government. At Sun Shipbuilding these problems no longer disrupt. Up to four years ago the preparation and mailing of these W-2 forms to our employees was a major job. The work was a combination of hand posting and mechanical operations. We put this job into Tabulating and achieved such unparalleled speed and accuracy that on January 5th of this year, we had the many thousands of W-2 forms completed and in the mail.

Materials and accounts payable analysis reports have been added to the responsibilities of Tabulating. We have coded 11,000 pieces of material which are used in the many shipbuilding and repair operations of the yard, and are able, for any month, quarter or year, to tell management the amounts of material purchased and at what points distribution commenced — an important function with the watch over short and allocated materials that must be maintained in the present emergency.



Photos courtesy of Remington Rand Inc.

**Tremendous fluctuations in numbers and amounts of payroll present serious management control problem. Sun Shipbuilding solves them by high-speed office machine methods such as this tabulator printing of checks from punched-cards.**

## CHECKING IS EASIER

The basic accuracy possible in the punched-card system brings these results which have given us 52 answers instead of the one we set out to find.

The exceptional accuracy now obtained in its tabulating department is a source of considerable satisfaction to Sun management. A recent study of payroll accounting showed a percentage of errors amounting to a fraction of 1 percent on initial operations. Since full verification means are used, these errors are quickly and easily detected.

It is a great satisfaction for the executive responsible for thousands of figures every week to have them produced accurately and on time in clearly printed reports that match our controls, many of them self-checking and, you might say, almost self-auditing.

# SOCIETY NEWS

**CHANGE OF S.A.M. NATIONAL HEADQUARTERS ADDRESS**

We are pleased to announce that on and after November 19, 1951 we will be located at Room 601, 411 Fifth Avenue, New York 16, New York.

MUrray Hill 3-6042

**SOCIETY FOR ADVANCEMENT OF MANAGEMENT, INC.**

## WASHINGTON UNIT HEARS TOP MANPOWER BRASS

THE WASHINGTON, D. C. CHAPTER had nine prominent officials connected with manpower utilization at their October meeting. The main speaker was Major General Lewis B. Hershey, Director of Selective Service, who has just returned from a survey of manpower utilization in Europe. Major General Hershey talked on "Current Developments in the Relationships of Selective Service to the President's Program for Manpower Utilization". Commander Ewan Clague of the Bureau of Labor Statistics discussed the U. S. manpower situation versus Russia's manpower force. Commander James Mitchell of the U. S. Civil Service pointed out that civilian government offices can be serious offenders against proper use of manpower and it is up to the managers to prevent this.

Major General Edmund Lynch, U.S.A.F., Department of Defense, Office of the Director of Manpower Utilization, explained the differences in our air forces and Britain's and discussed points in favor of each. Also present at the speakers' table were Ben Williams, management engineer of the U. S. Navy, Robert Clark, Director of Manpower, National Security Resources Board, Robert McDonald, Assistant to Under Secretary of the Navy for Manpower, Clarence Osthagen, Assistant to the Secretary of Commerce for Administration, William Parsons, Administrative Assistant to the Secretary of the Department of the Treasury, and Virgil Couch, Deputy Assistant Administrator for Management, Federal Civilian Defense Administration.

## JERSEY CHAPTER INCORPORATES, ELECTS ELEVEN TRUSTEES

THE TRENTON, N. J. CHAPTER on October 15th became incorporated. Clarence C. Martin filed with the Secretary of State in Trenton a Certificate of Incorporation of the Trenton Chapter. The trustees selected for the first year are: Clarence C. Martin, Oscar Dull, Jr., Gwendolyn Miller, Alex F. Hamell, Robert W. Kohfeldt, Thomas Haney, John G. Summerfeldt, Joseph R. Ryan, Malcolm J. Pollock, Carl Haas, and Ralph C. Malick.

At the October meeting of the Trenton Chapter the legal aspect of industrial relations was discussed by H. Collin Minton, Jr., prominent attorney, industrialist, and president of the Star Porcelain Company. A. H. Bergen of the Sloane-Blabon Corp. introduced the speaker.

## OFFICE WORK STANDARDS GREENSBORO, N. C. TOPIC

GREENSBORO, N.C. CHAPTER will hear at its November meeting Paul B. Mulligan, office consultant of New York City, who will speak on "Work Standards for Office Personnel". R. C. King, chief industrial engineer of Cone Mills Corporation is chairman of the meeting.

The monthly roundtable discussion and plant visitation for November will include a trip to The Lane Company of Altavista, Va., with the discussion centered on "Application of Conveyors and Related Problems of Incentive Wage Application". D. W. Fraser, supervisor, methods and standards department of The Lane Company will be chairman.

## CENTRAL N. Y. CHAPTER PLANNING METHODS CLINIC

THE CENTRAL NEW YORK CHAPTER, in cooperation with the Department of Administrative Engineering of Syracuse University, is planning a Methods Improvement and Work Measurement Clinic. The two-day session will be conducted by Professor Ralph M. Barnes on November 29 and 30. The intensified and capsule nature of this conference will enable plant managers, superintendents, engineers, foremen and office managers to better use the tools of Work Measurement and Cost Reduction. Information regarding admission may be obtained by addressing the Central New York Chapter, S.A.M., c/o Nestle's Chocolate Company, Inc., Fulton, N. Y.

## CINCINNATI PRESENTING HARVARD CASE STUDIES

THE CINCINNATI CHAPTER is running a series of "Management Case Study Conferences" with the discussions based on the Harvard Case Studies. The monthly conferences will be led by Chelsea L. Baily, instructor of Vocational Education at the University of Cincinnati.

At its October meeting the Chapter heard Dr. Robert J. Wherry, professor of Psychology of Ohio State University, on the subject of "Evaluation of Management".

## OCTOBER S.A.M. CHAPTER ACTIVITIES

THE ALLENTOWN, PA. CHAPTER on October 5th made a plant visit to the Bethlehem Steel plant at Bethlehem, Pa. The trip included witnessing a movie of Bethlehem Steel's wide scope of activities and a guided tour through the rolling mills, open hearth, machine shops, forges and laboratories. H. S. Carlough is chairman of plant visitation for Allentown.

THE BALTIMORE, MD. CHAPTER at its October meeting had Frank Palmer, vice president of Supervision Publishing

Company, Inc. Mr. Palmer is in charge of the Brookings Supervision Dynamic Economy Program and collaborated with Dr. Harold G. Moulton in writing "The Dynamic Economy". William G. Passano, president of the Waverly Press, Inc., as guest chairman, introduced Mr. Palmer.

THE BIRMINGHAM, ALA. CHAPTER at its October meeting had A. H. White of the Stockham Valve and Fitting Company as guest speaker. Mr. White discussed a system for training time study men so that a uniform rating of pace may be realized for operations commonly found in the steel industry. G. E. Tucker of the Talladega Cotton Factory was the meeting chairman.

THE BOSTON, MASS. CHAPTER heard Roger E. Gay, president of the Bristol Brass Company and a director of the National Association of Manufacturers say at their October meeting that the "manpower" problem in U. S. Labor today may well be a "womanpower" problem. Mr. Gay also stated that "womanpower" may solve the U. S. worker situation.

CENTRAL PENNSYLVANIA CHAPTER, State College, Pa., at its October meeting presented Robert Ramspeck, chairman of the U. S. Civil Service Commission, who spoke on the subject of "Government Management in the Time of Crisis".

THE CHICAGO CHAPTER had R. E. Worthington, president of Worthington Associates, Inc., Chicago, as the principle speaker at the October meeting. Mr. Worthington's topic was "What About Time and Stress in the Business World?". Berne Oswald, chairman of the monthly general meetings, introduced the speaker.

THE COLUMBUS, O. CHAPTER presented at an October meeting R. F. Canaday, of the employee relations staff of the General Motors Corporation, who spoke on the topic of "Better Management Through Better Employee Relations".

THE HUDSON VALLEY, N. Y. CHAPTER had as guest speaker at the October meeting S. Lester Block, a legal specialist on government finances and a member of the New York firm of Proskauer, Rose, Goetz and Mendelsohn. Mr. Block, who was introduced by Dr. A. E. Schaefer, declared that the Federal wage ceiling regulations were intended to be "dynamic restriction rather than static control".

THE INDIANAPOLIS, IND. CHAPTER began its 1951-52 season with its October meeting with Jack L. Kaufman, chief of personnel service of the Western Electric Company, as speaker. Mr. Kaufman, who is in charge of personnel services for 6,000 people, spoke on the subject of "Strengthening Relations Between Employees on Different Levels". Chairman of the program was William C. Murphy of the Eli Lilly Company.

THE LANCASTER, PA. CHAPTER's guest speaker for its October meeting was Walter A. Mattheiss, wage incentive consultant of New York City, who discussed "What's Wrong with Performance Rat-

## Bring Better Methods To Detroit Hospital

THE DETROIT CHAPTER has undertaken a project entitled "Improvement of Patient Care" which was organized at Harper Hospital in that city. Hospitals in the U. S. today are faced with critical problems in the shortage of professional personnel and increased patient costs. Other important factors contributing to the need for research and experimentation are the increasing demand for hospitalization by the public, need for more hospital beds and their staffing to give patients adequate care, tremendous changes in the type of care the patient receives due to many new drugs and advances in surgical techniques, increased costs due in part to the increased cost of supplies, a growing awareness that highly skilled personnel are performing duties which do not demand these skills and abilities, and due to the shortage of professional personnel, hospitals are closing units rather than opening new ones.

With all these factors in mind the project was undertaken by the Detroit chapter. A full-time person was employed to make a study of the project, backed by the limited financial aid of the Board of Trustees of Harper Hospital.

Although in the hospital the problem is more human than machine, the application of industrial engineering principles was possible and needed. Owen R. Goodrich of the Packard Motor Car Company and an active S.A.M. member consented to act on the over-all Advisory Committee and to present the results to the Society. The S.A.M. Committee met twice a week all through the winter and spring, planning the program and carrying it out. This Committee was composed of: O. R. Goodrich, Chairman, Packard Motor Car Co., Paul Wilson of J. L. Hudson Co., Gerald Clark of the Hudson Motor Car Co., Leonard Roberts of Burroughs Adding Machine Co., Donald McLandress of General Motors Corp., Frank King of the Detroit Civil Service Commission, Professor R. S. Jones of Wayne University, Raymond Helman of Precision Spring Co., Chester Brisley of Wolverine Tube Co., and J. H. Davis of the Aluminum Co. of America.

The main purpose of the program is to demonstrate to hospitals the values of establishing a methods department; how one might be organized, and how work in it might be carried out. So far S.A.M. has conducted one round of classes in work simplification principles to a pilot group composed of top management in the hospital, one round of classes in the supervisory refresher program for the Head Nurses who are first-line supervisory personnel and a group of men primarily from the Burroughs Adding Machine Co. and Wayne University have observed some of the hospital methods and made suggestions for improvement. Time studies have been made in patient units, using the Ratio-Delay time study technique which will be of much value to the entire hospital field.

Since the project was started for Harper Hospital, three other hospitals —Hackely Hospital, Muskegon, Grace Hospital in Detroit and Cottage Hospital in Grosse Point—have joined in the study.

ings". The meeting chairman was Alexander Boyne, chief industrial engineer of Frank Ix and Sons, Inc. of New Holland, Pa.

THE MANCHESTER, N. H. CHAPTER at the October meeting heard a talk on "A Few Hazards to Profits" given by George B. Heddenors, of the division of production management of Babson Institute. E. Coleman Beebe presided.

THE MILWAUKEE, WIS. CHAPTER had as its guest speaker for October Louis F. Hackemann, from the Training Services, Inc., Madison, Wis., who spoke on "The Cast Method for Executive Development." The S.A.M. members also toured the new Luick Dairy Company ice cream plant. This new plant is fully automatic, with push-button control.

THE MONTREAL CHAPTER presented P. C. Armstrong, economic consultant to the Canadian Pacific Railway Co., who spoke on the subject of "Inflation" at the October meeting.

THE PITTSBURGH CHAPTER has as its guest speaker at the October dinner meeting Merrick Jackson, vice president of Hill and Knowlton, Inc., whose topic was "Does the Message Get to Garcia?".

THE RICHMOND, VA. CHAPTER presented at its October meeting Arthur B. Davis, operations manager of the Virginia Bridge Company of Roanoke, Va., who spoke on "Profit and Social Progress". E. Starke Farley of the Reynolds Engineering Co., Inc., of Richmond introduced Mr. Davis.

WESTERN MASSACHUSETTS CHAPTER (Springfield) heard Phil Carroll, professional engineer of Maplewood, N. J. at the October meeting. Mr. Carroll's talk was entitled "Where Foreman and Time Study Man Meet?"

WILKES-BARRE, PA. CHAPTER at its monthly dinner meeting in October presented Major Lee White, industrial commissioner for the Scranton Chamber of Commerce, who spoke on the subject of "The Industrial Rehabilitation of Lackawanna County".

WILMINGTON CHAPTER's early November meeting presented Morris Bachlotte, supervisor of methods and systems, Old Hickory Rayon Plant, E. I. duPont deNemours and Co., who talked on "Functions and Organization of the Industrial Engineering Department".


# *Bestsellers All!*

**Reprints of the most talked-about current and recent ADVANCED MANAGEMENT articles are now available**

## YOUR CHOICE – 5 for $1
## OR THE ENTIRE 18 - for only $3

***Each article on this list has been reprinted – some several times – in response to steady demands for copies from Management Men all over the world***

51. **Keynote for Management-Industry Partnership,** by Thomas H. Carroll, Dean, School of Business Administration, University of North Carolina.
52. **Simplified Incentives for Multiple Production,** by W. Dale Jones, School of Industrial Engineering, Georgia Institute of Technology.
53. **Setting Cost Reduction Goals,** by Elliott I. Petersen, Vice President for Manufacturing, Bigelow-Sanford Carpet Co., Inc.
54. **Profit-Sharing — The Importance of Being Important Together,** by Clarence A. Wimpfheimer, President, American Velvet Company.
55. **Executive Development Through Colleges and Universities,** by Earl G. Planty, Executive Counselor, Johnson & Johnson; Dr. C. K. Beach, Professor of Industrial Education, Cornell University and Gordon Van Ark, Division Manager, Personnel Development, General Foods Corporation.
56. **Communications—What Are Employees Really Interested In,** by Peter F. Drucker, Industrial Economist.
57. **What Makes Successful and Unsuccessful Executives?** By Burleigh B. Gardner, Executive Director, Social Research, Inc., Chicago.
58. **Human Relations in Industry: A Challenge for Free Enterprise, "Industrial Relations and the Social Psychologist."** By Dr. Douglas McGregor, President, Antioch College.
59. **Resistance to Change — Its Analysis and Prevention,** by Alvin Zander, Research Center for Group Dynamics, University of Michigan.
61. **Wartime Lessons in Wage Administration,** by Canby Balderston, Dean, Wharton School of Finance and Commerce, University of Pennsylvania, and Former Assistant Chief, Civilian Personnel Branch, Industrial Personnel Division, Army Service Forces.
63. **Staff Organization for Control,** by J. K. Louden, Vice President, York Corp.
64. **Efficient Planning for Budgeting,** by Charles C. James, Associate Counsellor, Stevenson, Jordan and Harrison.
65. **Budget Navigation by Dead Reckoning,** by Alwyn M. Hartogensis, Ebasco Services, Inc.
66. **Democratic Principles in Business Management,** by James C. Worthy, Sears, Roebuck and Company.
68. **Personalities in Labor-Management Conflicts,** by A. A. Imberman, Imberman & De Forest.
69. **Decentralizing Personnel Management,** by Mary Cushing Niles, Assistant to the Chairman, Federal Personnel Council.
70. **Executives Evaluate Administrative Conferences,** by Dr. Martin Kriesberg, United States Bureau of the Census.
71. **Size and Effectiveness—An Administrative View,** by Howard K. Hyde, Department of Defense, Washington.

Order Coupon

**SOCIETY FOR ADVANCEMENT OF MANAGEMENT**
411 Fifth Avenue - New York 16, N. Y.

Please send ..... copies of the following reprints:
Numbers ....., ....., ....., ....., ....., ....., ....., ....., ....., .....,
at 25 cents each — or Five for $1

..... Put a check mark here to order
THE FULL SET OF 18 REPRINTS for $3

Enclosed find check (or money order) for $.....

Name .....

Address .....

.....

I am a member of S.A.M. .....

# Individuals—and a Team—Will Make it Work

By HAROLD R. NISSLEY

Management Consultant
Cleveland Heights, Ohio

***The technological and the human relations (enthusiastic acceptance) aspects of the installation of a Work Simplification program are both primarily Management's problems. Here are some suggestions for recognizing the individual and group roles in pondering the question: "What type of Work Simplification program—if any—will yield the highest return in man-hours and money?"***

WORK SIMPLIFICATION or motion economy is nothing more than the organized application of common sense to everyday tasks or work. Work Simplification boils down to two essentials: (1) Finding better ways of doing jobs; and (2) getting others to adopt (enthusiastically) these better ways.

A work simplification program can range from a modest job-by-job improvement program executed by an enterprising plant industrial engineer (or progressive foreman) to in-plant and distant instruction in the technical and human relations aspects of this scientific management tool. What approach should be made at a given time and under certain operating conditions will be conditioned by a number of factors. Top management will, of course, attempt to answer this question:

"At this time, what particular Work Simplification program (if any) will yield the highest return on my investment in man-hours and money?"

## THREE KEY GROUPS

Because Work Simplification has eased the man-power and tooling problem for some firms, others have come to believe there is special magic in the words themselves. They either do not stop to consider what has gone into highly successful Work Simplification programs or they think they can perform the same miracles with less time, effort, and expense.

Work Simplification has worked best, by and large, in those instances where management recognized the importance of three groups: (1) the outside consultant; (2) the supervisor; and (3) the operator (and the union).

## ROLE OF THE CONSULTANT

Finding a better way of doing a job can't always be done, quickly, even by consultants. To be sure the expert can point out obvious improvements (frequently overlooked by local talent because of other daily distractions); these improvements often suggest solutions to other more perplexing problems. But the consultant's main contribution to many Work Simplification programs is the stimulus he has upon the rest of the organization: the plant industrial engineers, supervisors, union and other hourly rated and salaried people. This stimulus comes about in several ways: (1) Usually the outside expert can bring the experiences of other companies to bear on local problems; (2) frequently he is armed with appropriate visual aids and equipment which usually outrun the cost of a course he may be conducting; and (3) he generally has pamphlet and mimeographed materials already worked up so that conferences proceed smoothly and with a minimum of lost time.

In addition to acting as a thought accelerator in a methods improvement program, the expert may be of considerable help in selling new work habits. He might, for example, discourage a management from "springing" new ideas on old operators. Experience (and common sense) has taught him that springing new ideas which involve sudden changes in habits is akin to sneaking down in the middle of the night and rearranging all of the wife's cooking utensils in the kitchen. He understands how much greater is the resentment of an operator whose work habits are abruptly changed without her fore knowledge or consent.

## ROLE OF THE SUPERVISOR

Great as the help is that a consultant may render, the king-pin to a truly successful Work Simplification program is the supervisor collaborating with the consultant and/or his own staff industrial engineer(s). Unless the supervisor is sold on the theory and practice of Work Simplification as it applies to his department, very little tangible good will come from such a program. One way of selling the program to the supervisors is to give them a foretaste of what it will be like. Call them in for a "sample" conference or session and let them mull it over before a final decision is made to go ahead with the program. Thus, part of the responsibility for the success of the program rests with them after *they* have decided to divert their time and energy to such a program. This seems reasonable when it is remembered that such a program will compete with scores of other pressing matters both inside and outside the plant.

The role of the supervisor will be somewhat that of a catalyst. He will take from conferences those ideas which he believes will work successfully in his department at this time and under present operating conditions; these ideas he will put to work (with or without any further help from the conference leader or his own industrial engineer). There is a saying: "Experts should always be on *tap* but never on *top*." The foreman and the superintendent are the 'top' men in any successful program. The only

# More Work-Wonders and Less Magic Mumbo-Jumbo

Work Simplification programs have worked wonders for some firms.

Others think they can substitute "miracles or magic" for "wonders — and work."

The author of the accompanying brief article maintains that in looking for such miracles there is failure to consider the amount of thinking and effort that has gone into the successful Work Simplification programs to:

1) Find better ways of doing the job, and,

2) Getting others to adopt—enthusiastically—these better ways.

Work Simplification, the author holds, is best achieved where management recognizes the importance of these three groups: a) the outside consultant, b) the supervisor, and c) the operator (and the union).

The role of each of these, of Management, and of the team the four groups can make, is pointed up by this Ohio management specialist in effective anecdotes and summaries.

reason outside help is solicited is someone believes such help can accelerate cost-reduction and labor-saving thinking and action.

This is as it should be. The foreman knows his people better than anyone else in most instances. He frequently knows the limitations of his materials and machines better than most outsiders. He is in a good position to evaluate the importance of various phases of his job and to integrate these phases into the total job.

## ROLE OF THE OPERATOR

Just as the supervisor knows more about many of the details of jobs in his department than does the plant industrial engineer (or the consultant), so does the operator know more about his particular job than does the foreman. Many of the operator's ideas are dormant and need just a little stimulating. Imagine the possibilities of a situation resembling this hypothetical shop scene:

*Supervisor*: "Girls, next Monday morning just after your rest period, I'd like to discuss with you ways of increasing production and at the same time making jobs easier. Let's all be thinking about this between now and Monday. And remember, I am just as interested in making your jobs more attractive as I am in getting out more production."

Such a group conference might be called before, during, or after some Work Simplification indoctrination (movies, demonstrations, and talks).

## DESIGN AND ACCEPTANCE

Willa Cather once wrote: "Man is the only animal who fights to stay in a rut."

There are two common ways of changing old work habits: by dictum; by education and persuasion. The dictum method is the fast method; but you never can be sure how long the new idea will stick nor what the consequences will be. The practical differences between these two methods is illustrated by the following true story:

> The vice president of a printing firm was telling a friend how his company planned to change over their lighting system during the next twelve months. The friend said: "We plan to do the same thing; but we expect to do it in two weeks—during the summer vacation."
>
> Although a highly progressive executive, the VP did not change his new lighting schedule. Having taken one of the country's leading courses in Work Simplification, the VP went the full gamut on the selling phases of a "radical" departure from a 25 year old lighting system. He knew he had to because he was dealing with some of the most reactionary of trade unionists—printers.
>
> Instead of hanging fluorescent luminaries high and out of sight, he instructed the electricians to put them directly in front of the shop craftsmen. Thus between the VP and the electricians one of the worst lighting installations in lighting history was executed—in one section of one department.
>
> As was expected, the craftsmen and the union officers complained so bitterly about glare, headaches, heat, ad infinitum, that a meeting was finally called. It took two meetings to evolve a lighting system that was every bit as good as that worked out by nationally known lighting experts whose plans were laid aside at the beginning because of their radical nature. (It should have been as good; it was the original plan, but the craftsmen thought it was theirs.)
>
> Several months afterwards the VP met his friend again and asked him how his people liked their new lighting system. "I could have saved our company $75,000 and a *strike*, if we had never tried to improve the lighting," came the reply.

The foregoing story illustrates a basic point in modern management philosophy. The executive above who exercised his right to manage even in those things affecting the happiness and welfare of his people ended up with a strike.

## CLOSE THESE GAPS

Obviously an enlightened management cannot let its people in on every decision affecting the company and their welfare. But the more the people are left out of such decisions, the wider becomes the gap of suspicion and distrust and even open violence.

A well conceived Work Simplification program should include three important groups, for optimum results: 1) outside professional talent; 2) supervisory help and collaboration; and 3) operator help and collaboration. Such a program can make work easier, increase production, spin out labor, materials, and machines during a critical shortage of all three, cut costs without hurting anyone, and be fun doing it!

# Charting the Informal Organization

By WILLIAM B. SEINIGER

Assistant Dean, School of Business Administration
University of Buffalo, Buffalo, N. Y.

***The contactual survey is suggested by the author as a technique to supplement the survey and charting of the formal organization, in this discussion of the range and significance of relationships that exist in every work group.***

UNLIKE THE ACCOUNTANT, the statistician, or the engineer, the designer of an organization has few tools of analysis to use in studying and improving the organizational structure. With all of its faults and limitations, the predominant analytical tool available has been the formal organization chart. However, in constructing and using such charts, most staff organization and methods specialists, as well as most of those in top management, have concerned themselves mainly with the allocation of authority and functions.

While the sociologists, the psychologists, and the educators have made scores of empirical studies and written thousands of words on the informal organization and its importance, the great majority of those in industry have felt that the informal organization is a mysterious phenomenon — a variable which the administrator must recognize as existing but one which he cannot hope to chart or control. One of the reasons for this is that those doing research in the fields of the social sciences have been concerned with the development of so-called "administrative principles" and the development of individual and group behavior theories. The academicians have developed few serviceable tools of analysis which can be applied readily to concrete situations; tools which would enable administrators to observe and delineate the informal structure existing within their own organizations.

The purpose of this article is to suggest as an additional tool of analysis, a technique to be used as a supplement to the survey and charting of the formal organization. This device, the *contactual survey*, is intended as an aid in tracing the actual working contacts between members of an organization—work relationships and lines of communication often unknown to those not on the same organizational level or even to those not in the same organizational vicinity.

## FORMALIZE AND DESTROY

Most organizations have within them persons of great influence who operate in an informal organization and who have little or no formal status. Moreover, as Chester Barnard points out, to give such individuals formal status, might well destroy their influence and their effectiveness. Seldom could one learn of such individuals from a study of the formal organization chart.

Divisions and departments sometimes grow up around the problem-solving abilities of a particular individual and this condition may or may not be accorded recognition in the formal chart. If not, in a large enterprise, the situation may be lost sight of in seeking the justification for the particular divisional or departmental structure.

Informal organizations often spring up to implement the formal in order to serve as a communication system. Through this system flashes a myriad assortment of intangible facts, suggestions, opinions (and even suspicions) that cannot pass through formal channels without raising issues calling for decisions, taxing available executive time, or threatening executive prestige. The usual charts and manuals do not show these informal channels of communication.

## CITES STODGILL STUDIES

A number of social workers and educators have used the analytical method devised by J. L. Moreno, known as the *Sociogram*. This is a chart containing circles or boxes representing individuals in the group under study, and it attempts to present graphically the entire structure of relationships existing at a given time. (See Figure 1) The lines of interaction, showing the relationships, are based on answers to the question, "With what person or persons (in the particular group) would you prefer to spend your time?" Those individuals having a number of lines of preference directed to them are assumed to be group leaders or at least leaders of internal cliques.

The basic idea of the sociogram has been applied to working organizations, as in the case of Stodgill's study of the working relationships in certain Navy offices. The same idea has been modified by charting the relationships on the basis of frequency of contact. The individuals under study are asked to name the three group members with whom they spend the most time on the job.

Presumably the same idea could be applied to studies of business organizations. However, it is the writer's opinion that the sociometric test and its diagrams are not sufficiently accurate for specific administrative use in business organizations. If diagrams are made on the basis of choice, they do not explain the underlying motives, nor do they, in and of themselves, reveal the values of interaction.

Furthermore, in and of itself, a diagram based on preference does not reveal relationships that actually do exist. As for diagrams based on time spent with an individual, in the opinion of the writer, they are of much greater value. However, time alone does not signify the relative importance of such contacts.

## FIXING POINTS OF CONTACT

The number of industries continually and systematically studying their own organizational structure is still pitifully small. Nevertheless, it is encouraging to note that the number is constantly increasing as more of the large corporations are installing organization and planning staffs and specialists. Those companies having such staffs and specialists are best equipped to make this type of survey since they already have trained personnel who are charged with the job of examining the formal organization.

It is recognized that any attempt to undertake a contactual survey of the entire organization at one time would be so complex as to be unwieldy. In a large enterprise the analyst, even if time permitted undertaking a survey of the entire organization, would be lost in a maze of contactual lines crossing and criss-crossing one another. The study should be limited to particular problem areas. It is felt that if studies are made of specific organizational problems as they arise, the information gained will be of great value in making the necessary management and administrative decisions.

In studying the informal organization and the points of contact, it is suggested that the analysts divorce the contactual study from the regular organization survey. Obviously, any questionnaire or direct type of interrogation as to the presence and nature of the informal organization would produce very little, and anything it did produce would be almost certain to be wrong. The best way to make such a survey is to use the procedural study as a medium.

## THE ANALYST'S JOB

Let the examiner analyze a procedure, such as that for handling purchase requisitions, engineering changes, or scheduling and routing of production. As an interviewer and observer, the analyst will first pick up those facts, presumably known already, such as the lines of authority and responsibility and the channels of communication which are set forth in the existing formal organization chart. In the course of the study, however, the expert will pick up clues to the *actual* working relationships between members of the organization.

For example, in a certain department it might be, according to the procedures manual, that work is not to be routed to a particular machine or process until it has been scheduled by the department head and authorized by the general foreman. The analyst, however, may find that the operator of the machine or process in question frequently handles work of another department as a favor to a worker in that department. These two workers have established a working relationship of an informal nature on an agreement basis, either explicit or implied.

Another instance would be that of tracking down the procedure followed in handling any difficult or unusual problem. To whom did the people concerned turn for assistance, for information, for opinions, for policies? By focusing their attention on the step-by-step procedure that was followed, the analyst will observe contactual relationships that the individuals concerned would almost never describe voluntarily, even if they recognized them.

It is apparent that a few of the relationships will overlap several of the above classifications to some extent. Nevertheless, most situations can be fitted into one of the above categories with at least a fair degree of accuracy. If the analyst uses a modified form of the sociometric chart to illustrate the contactual pattern he may place numerical values on the lines of interaction.

Gathering information of this type calls for highly skilled personnel. Those engaged in such work must possess a real knowledge of organizational theory, a complete understanding of their own firm's policies and objectives, considerable experience in systems and procedures work, and a large amount of tact. Needless to say a job of this nature provides an excellent training device for prospective top level executives.

Because costs must be considered, it is only logical to ask the questions: a) Of what specific use is such material?, and b) Will the work pay for itself?

The information will have a number of uses, each of which definitely will pay for the work expended. The most important uses visualized are as follows:

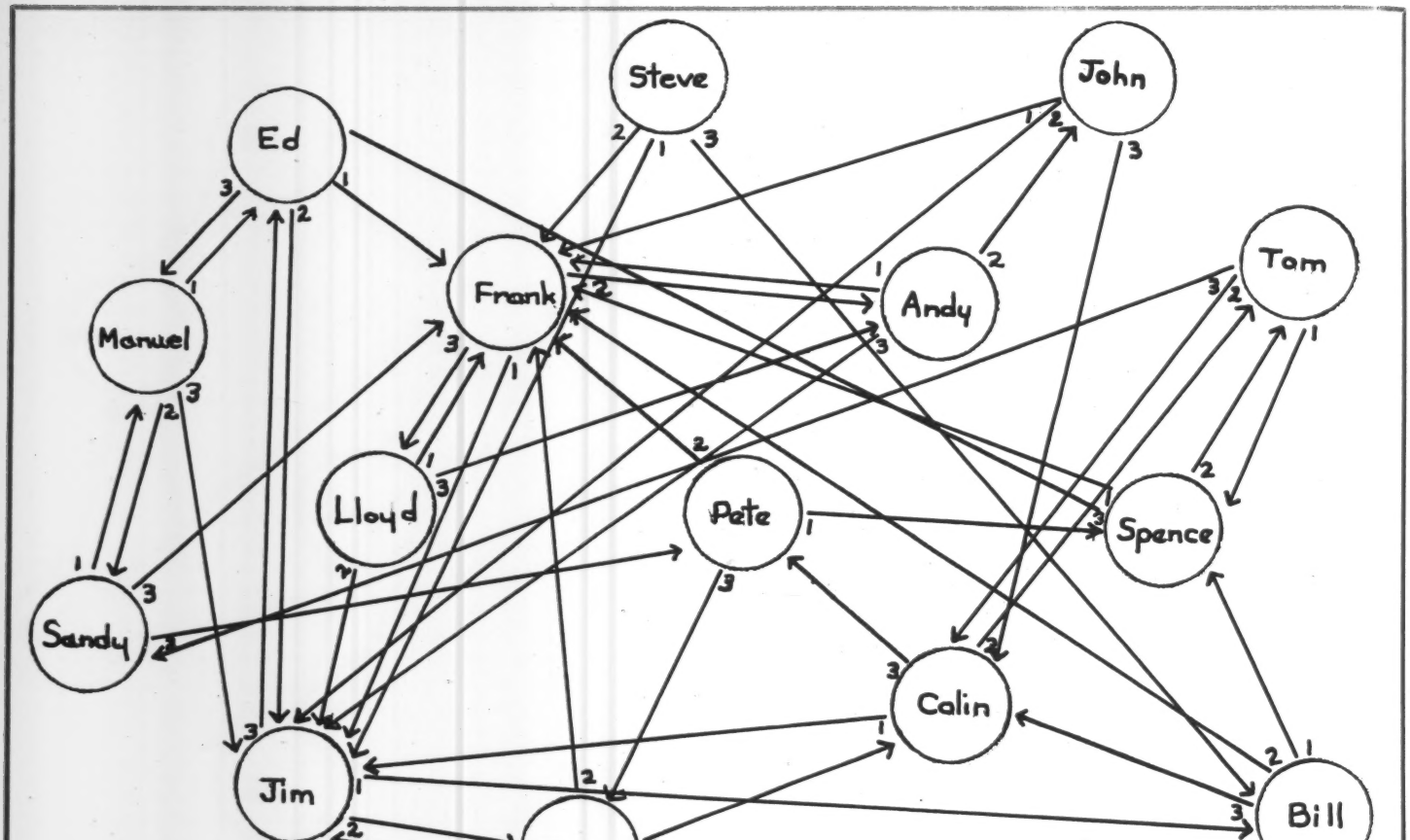
1. *Aid in checking the accuracy of the formal organization chart.* It is to be expected that studies will show several points on the chart of the formal organization that do not conform to the actual working relationships. The question is, what should management do about such cases? Before making any recommendations for change, analysts must remember that departures from the formal organization chart are not necessarily bad. In a number of situations the

## Contactual Relationship Types Are Significant

In the opinion of the writer of the accompanying article, the significance of a contact lies in its type. It would seem that contactual relationships are of one or more of the following types, each varying in importance. Those concerned with:

1. Seeking or exchanging opinions on matters pertaining to the company, the job, or the organization; also, the voicing of opinions by one who has considerable authority or prestige.
2. Communicating complaints and criticism.
3. Obtaining aid of one skilled in arbitration or who customarily acts as a go-between.
4. Working out agreements as to decisions, timing, reciprocal action, etc.
5. Obtaining aid in problem solution.
6. Obtaining information and data.
7. Obtaining aid in work accomplishment.
8. Obtaining instruction and training.
9. Communicating directions and orders.
10. Obtaining approvals and authorizations.

These types of contactual relationship can be combined and grouped into categories that provide a rough measure of significance, varying from most important to least important or neutral.




Example of a Sociogram

answer may well be, "Do nothing about it—at least for the present." In fact, wherever the informal group seems to be functioning for the benefit of the enterprise, the formal structure should be left as is or changed to *facilitate* the functioning of the informal group. The important thing is that with a knowledge of actual working relationships the organization planner can do a sounder and more practical job. Many of the blocks and much of the red tape can be cleared away. Communication through informal channels is something like the physical force of electricity; left to its own devices, the informal organization will seek the simplest and most direct way of communicating. The difficulty is to make sure that in simplifying the channels of communication the informal organization does not short circuit the lines so that necessary points along the route are cut off.

2. *Aid in planning anticipated organizational changes.* Top management is always interested in changing its organization to meet changing conditions. Many of these changes are at a level which affects the supervisory structure or which involves shifts in departments. Many writers and business consultants have emphasized the impact that any change can have on workers, supervisors, and executives. Armed with intelligence as to existing working relationships, the planner can lessen this impact by avoiding many unnecessary dislocations of informal groups.

## FOR BUDGETARY CONTROLS

3. *Aid in installing such managerial devices as budgetary controls.* The installation of a system of budgetary control is a task of considerable magnitude and importance. Costs cannot be controlled unless the responsibility for those costs and for their variance from standard can be fixed upon the supervisor who actually regulates their amount. Too often, in defining an organizational structure, a supervisor is assigned the responsibility for the control of a cost when, in actuality, he has no control over the expenditure even though he may have to go through the formality of signing approvals of such expenditures. The simplest and most dangerous procedure is to try to establish cost centers on the basis of a formal organization chart.

4. *Aid in solving problems of communication.* Communication has become one of the major problems of the large enterprise. By knowing the informal channels top management can utilize them in many cases to free the flow of information traveling in both directions. It is a fact that information given to a pretty stenographer will often be transmitted faster and farther than all of the memoranda written. Of course, it is true also that an informal organization can block communication and restrict information to its own group. The fact remains that communication depends upon contactual relationships. These are the switches that extend or shorten the communication lines.

5. *Aid in locating people who can be counted upon to facilitate action, dis-*

*sipate resentments, or clear up misunderstandings.* There are people in an organization, often without any formal status, who have the confidence of their co-workers and who convince their co-workers of the necessity of doing things in a prescribed way, who explain, expedite, and in general serve as a balance wheel. Knowing of these people, their contactual relationships, and their abilities can help to keep things running smoothly if management will try to preserve such worker's positions in the organization and will make certain that pertinent policies, changes, and decisions are clearly explained to these workers.

### FOR 'RIGHT' CONTACTS

6. *Aid in learning the "right" contacts to make in order to get action, approval, or information.* The "right" person to see is most important at the top level of management. Few formal organization charts indicate the *horizontal* channels of communication that exist. Such charts will show lines of authority and responsibility heading up to the president. Obviously, however, the president cannot handle every matter completely, even though it be of major importance. The top level executives have informal organizations and cliques of their own. Here is where influence and opinion play their strongest roles. In smaller companies these channels of communication would be known to most of the organization but in a large enterprise with widespread plants or branches there are too many executives even at the so-called top level echelon. A knowledge of the working relationships between these individuals helps others to sound out reactions to ideas, to line up support, and to determine through discussion, aspects of a problem that have not been thought of previously. Such pre-planning saves time and discouragement.

### FOR LOCATING LEADERS

7. *Aid in locating leadership material.* Another major problem of any organization today is that of securing competent executive material. Many individuals that are centers of informal groups have already shown themselves to be leaders. Of course, the results of any contactual survey will not be at all conclusive and must be used only as a starting point. These individuals may be incapable of functioning as leaders if given formal status, as has been pointed out already. Furthermore, they may possess the wrong type of background, philosophy, or ambitions from the management point of view. Nevertheless, the information provided by the survey helps to locate a supply of potential leadership material within the enterprise's own organization.

# The Management Bookshelf

***Better Foremanship—Key to Profitable Management,*** by REXFORD HERSEY, Conover-Mast Publications, Inc., New York, 1951, $3.75.

"This book . . . is directed primarily to the foreman. Its purpose is to give him the working tools of *his profession,* a basic conception of how to handle them, and a practical concept of his day-to-day job. Throughout, I have endeavored to confine myself to those *techniques and principles which have proved their value many times over in practical use.*

The foreman's performance and efficiency, however, can be helped or hindered by the attitudes and judgment of the higher supervisors and management. This being true, I have in several chapters toward the end of the book dared to make some suggestions to management concerning the steps it can take to make for better foremanship." (From the Author's Preface, underlining mine.)

The nine chapters of the text proper cover such broad yet practical areas as: what it takes to make a first class leader, the foreman as a practical psychologist, the foreman as an administrator, the foreman as a job analyst, the foreman as an instructor, the foreman as a safety engineer, the foreman as an executive, the foreman on the way up, and the foreman as a part of management. The three appendices are devoted to 1) a checklist to aid in the rating of foremen specifically in terms of job performance, 2) a self-test of leadership ability and 3) a self-test of knowledge of good personnel practices and policies.

The regular reader of Dr. Hersey's on the subject of foremanship will recognize many sections of this book as material he has met before. In fact, most of the book appeared as a series of articles in *Mill and Factory* and are reprinted here for the convenience of foremen and developers of foremen.

The style of writing, primarily in outline form, makes for a certain monotony for the reader but it also enables the author to pack a terrific amount of material into a relatively small volume. The over-simplification of some ideas may also lead to a false sense of understanding by the relatively unsophisticated reader.

However, there can be no doubt that the foreman who reads, understands *and practices* the principles, tools and behaviors set forth by Dr. Hersey will be not only an outstanding credit to the profession of foremanship but a real force for harmonious employee relations, productivity and a leader of men.

EDWIN R. HENRY
Employee Relations Department
Standard Oil Company (N. J.)
New York, N. Y.


**Reward!**

**...rich rewards to those who find uses for**

**VEEDER-ROOT COUNTERS**

**as built-in parts of their products**

**It takes time and brainwork ...both on *your* part and ours...to determine profitable uses for Veeder-Root Counters as built-in parts of your product. And this search may pay off *plenty* ...as in the case of the X-ray tube manufacturer who found a way to make V-R Counters (built-in as standard parts) prove his product's guarantee! NOW... let's see what we can do for *your* product.**

**Write today for Free 8-Page "COUNT BOOK"**

**VEEDER-ROOT Inc., Hartford 2, Conn.**